JANUARY 1924 25 CENTS

The Wireless Age

"America's Foremost Radiophone Review"

Features in this Issue

The Big Chicago Radio Show

A New Wireless Age Receiver
Push a button—that's all!
Easily Constructed

DX in the Grand Canyon

The Woman Listens In

Cunningham

RADIO TUBES

The Heart of your Receiving Set

IN the case of all living things the heart is the most vital organ. Weaken, injure or destroy the heart and life is accordingly weakened, endangered or destroyed.

In a radio receiving set the tube is analogous to the heart. Remove it entirely and the set will cease to function. Use an inferior tube and the results will be inefficient and generally not pleasing to listen to.

In living things a perfect heart does not always insure a healthy body, but on the other hand it is indispensable. The same is true of the radio receiving set. It may be perfect in every detail but unless the best tubes are used the results will not be perfect.

Cunningham Radio Tubes were developed in the great Research Laboratories of the General Electric Co., and are now being made in that company's modern and mammoth factories under the supervision of highly skilled engineers.

Better tubes are not attainable. There is a model specially adapted to every set, every circuit and every socket used today. Every radio dealer can supply you with Cunningham tubes. Buy them for replacements. Insist that they be included when purchasing a new set—and you will know that your receiving set has a perfect heart.

The care and operation of each model of Receiving Tube is fully explained in our new 40-page "Radio Tube Data Book." Copies may be obtained by sending ten cents to our San Francisco office.

Cunningham Radio Tubes

C-301A—6 Volts ¼ amp. Amplifier	$6.50
C-299—3 Volts .06 amp. Dry Battery Det. & Amp.	6.50
C-300—6 Volts Gas Content Detector	5.00
C-11—1.1 Volts .25 amp. Dry Battery Det. and Amp. Special Base	6.50
C-12—Similar to C-11 with standard base	6.50

PATENT NOTICE

Cunningham tubes are covered by patents dated 11-7-05, 1-15-07, 2-18-08, and others issued and pending. Licensed for amateur, experimental and entertainment use in radio communication. Any other use will be an infringement.

E. T. Cunningham Inc.

Home Office: **182 Second St. San Francisco, Calif.**

154 West Lake Street Chicago, Illinois

30 Church Street New York City, N. Y.

SCOTLAND Yard, as well as our own Federal Secret Service—for the capture and conviction of criminals, depend upon the marvelous sound transmission of the *Detective* DICTOGRAPH.

The Embassy at Paris, as well as our own great General Electric Company—for the efficient operation of their organizations, depend upon the marvelous sound transmission of the DICTOGRAPH *System of Interior Telephones.*

Famous members of the European nobility, as well as our own thankful citizens—for the restoration of their lost hearing, depend upon the marvelous sound transmission of the DICTOGRAPH *Acousticon.*

Similarly, five hundred and forty prominent European amateurs taking part in the trans-Atlantic tests, as well as twenty-three hundred and fifty expert Americans also participating—for the reception of loud, clear signals from foreign shores, depend upon the marvelous sound transmission of the DICTOGRAPH *Radio Headset.*

This superlative instrument represents the latest and greatest DICTOGRAPH achievement. The coils are rated at three thousand ohms resistance. The weight is 10 ounces. The price is eight dollars.

If your dealer does not carry the "Aristocrat" write direct to this company, giving his name

DICTOGRAPH

220 W. 42d ST. PRODUCTS CORPORATION NEW YORK CITY

The Wireless Age

America's Foremost Radiophone Review

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Your Authors

MR. R. H. G. MATHEWS (The Chicago Radio Show) is manager of the Central Division of the A. R. R. L. Matty, as he is known to thousands of radio bugs, operates under the call 9ZM, and is one of the best known of the old timers.

In the past he has been active in the promotion of the amateur radio shows in Chicago and in the starting of *Radio Topics* which was formerly the official organ of the 9th district Council. He is now with Zenith.

MR. DONALD GORDON WARD (R. F. Amplification and Regeneration) is the technical instructor in the Radio Institute of America. He made a receiver at the precocious age of 10, and was the seventh licensed amateur in the 1st District. His course in electrical engineering brought him to 1917 and the World War, in which he participated as a member of the U. S. Army Signal Corps. He has been a Marconi man on several ships, and has had a wealth of operating experience.

MR. JOHN R. MEAGHER (Push Button Receiver) designed The Wireless Age Uni-Control Receiver, described in the December issue, which won immediate popularity. His chief joy in life seems to be, after getting through with the construction of one set, to turn impatiently to fresh experiments. He wastes little time in enjoyment of the fruits of his labor, and gets no thrill from the fact that the completed set works. "Of course it will work!" he exclaims with asperity; and of course it does.

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Major Jerome W. Howe, Editor — John R. Meagher, Technical Editor — C. S. Anderson, Associate Editor

Because certain statements and expressions of opinion from correspondents and others appearing in these columns from time to time may be found to be the subject of controversy in scientific circles and in the courts, either now or in the future and to sometimes involve questions of priority of invention and the comparative merits of apparatus employed in wireless signaling, the owners and publishers of this magazine positively and emphatically disclaim any privity or responsibility for any statements of opinion or partisan expressions if such should at any time appear herein.

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You Young Men Who Want to Make Big Money—

Consider These Startling Facts!

Are you ambitious? Are you looking for an opportunity for quick advancement? Here's a real "money-making tip"—sound, practical advice from a man who is qualified to give it. No matter what you are doing now—no matter what your experience in the past has been—if you are sincere in your desire to make big money and to achieve something really worthwhile, you will read, carefully, every word of this message.

Thousands of young men who might be earning big money now—who might later be America's leaders—are doomed to fail, simply because they are not looking ahead and building for the future.

In my own life-time, I've witnessed scores of conspicuous successes—and even more pitiful failures. And the striking fact is, that it isn't always the clever man who succeeds. It's the man who uses his "grey matter" in selecting a life work, who plans now for tomorrow.

What field of endeavor offers YOU the greatest chance for making good!

The Field In Which It's Easiest to Succeed

In general, new fields offer by far the best opportunities for rapid advancement and big success. In the old, well-established professions and businesses, the odds are against a man jumping ahead unless "the breaks" favor him to an unusual degree or else he is a genius — and there are few of them.

On land and sea hundreds of big money positions are calling for trained men.

But in new lines of endeavor, it's different. I've noticed it time and again. Take the railroads years ago. I recall many of my boyhood friends who went in "the railroad game." Today many of these ambitious men, who started without any special experience or education, now are high executives; one is *president* of an important road. There's only one explanation for their swift progress. They got in on the ground floor where there was plenty of elbow room—and nothing at all was there to hold them back. So they jumped ahead rapidly.

The same story is true of electricity, the telephone, the telegraph, the automobile and many other fields. Each had its day, and each offered extraordinary opportunities to those who got in early.

A few years ago, the field of greatest promise was *advertising*. And now—*today*—a new industry is coming into existence which will in all probability offer more and better opportunities than any other field in the history of industry—and that field is RADIO!

More Money For YOU

It's been my good fortune as chief instructor for the world's foremost radio school to have trained hundreds of young men for the radio profession and to have come into contact with the developments of this fascinating branch of science. I tell you that not one person in a thousand *dreams* of the enormity of this business as it is today. And no one can possibly foretell to what limits it will grow in the future.

Take broadcasting alone. Most people think of radio in this connection. Hundreds of broadcasting stations have come into existence. Millions of dollars worth of equipment has been sold, and like the automobile business, there will be almost no limit to this end of the radio business.

But Radio's real growth in the future will not be along the lines of pleasure. Radio has grown to be the most practical and economical form of communication. It is being used by every ship on sea. It has been adopted by business houses, banks, exchanges and all progressive firms. The Government now uses Radio in its police service, in the postal department and almost every other department.

Already we have classrooms being taught by Radio. Almost every day we hear of some new use for this wonder science. Radio is one of our greatest industries today, but as yet it has only started to grow. It is the one great field of promise of the future!

Men Wanted In This Field

This tremendous industry came into existence almost over night. Already fortunes have been made by the most wide-awake ambitous men—many of them who seem to me to be nothing more than boys, they are so young.

I wish that space would permit me to give just a few examples of how young men, my former students, have jumped ahead in Radio. There's nothing surprising about their successes though. The opportunities are there—thousands of them. Naturally the man who is on the spot, who gets in at the beginning, is the one to profit by them.

Young men are needed now in Radio. On land and on sea, there are opportunities—and opportunities that offer greater promise than those in any other field.

My Advice To Ambitious Men

Here's the advice I want to give to you men who are farsighted—you men who are honestly anxious to make good. Learn more about the field of Radio. You will be amazed at what a huge industry it is. Your eyes will be opened to possibilities for advancement you never dreamed existed.

Get the facts on Radio. You can easily learn all this—without any obligation at all. In order to help the Radio Industry get the men it needs so badly, I have compiled a wealth of interesting facts on this wonderful new industry—facts on the amazing opportunities, and some helpful advice on just how to go about profiting by them.

Remember—it doesn't cost a penny to get these facts. You're ambitious. You're on the jump for any good opportunity. No matter whether you think you are going into this field or not—get full details on it.

Simply mail the coupon for my free book "Radio Your Career." Mail it *now*—while you think of it.

JAMES A. DOWIE
Radio Engineer
RADIO Dept. 46A **VIRGINIA**

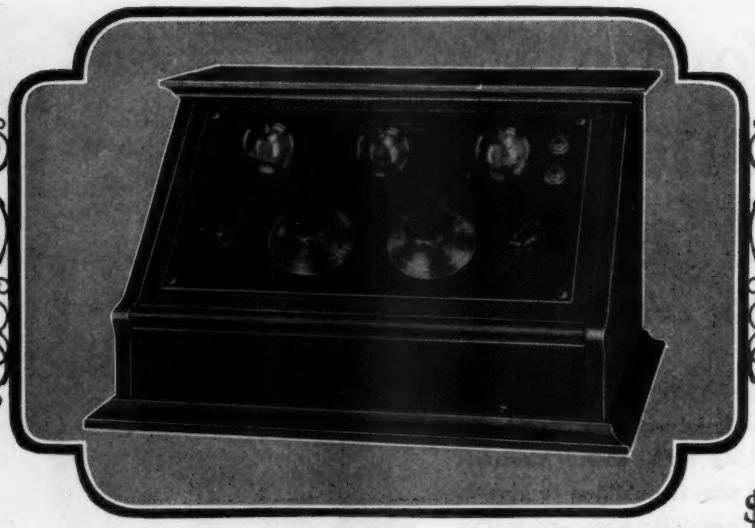
JAMES A. DOWIE
Radio Engineer
Dept. 46A
Radio, Virginia

Please send me without cost or obligation your free book entitled "Radio Your Career" and advice on how I can make the biggest money in this new industry. (Please write plainly).

Name .....

Address .....

City ..... State .....



MODEL V

$125.
fully equipped

A New and Radical Radio Achievement

This new Kennedy Model V is one of the foremost contributions ever made to the radio art. It was developed by the Kennedy Engineering Staff to meet a definite demand for a receiver with greatly simplified control—but with the same high standards of selectivity and mechanical excellence that have always distinguished Kennedy radio equipment.

The most striking individual feature of this new Kennedy Model V is its utter simplicity of operation. After a single initial setting is made, only one dial is used to control all tuning. And with this simplicity of tuning comes the positive assurance that, night after night, a given station will "come in" at its own particular setting—*even though the receiver is tuned on different antennae.*

Model V is very selective. For instance, in New York one of these receivers located in the Belmont Hotel "tuned out" station WEAF, only two blocks away, and "brought in" out-of-town stations. It is stable in operation, reproduces music and voice with unusual fidelity and is credited with remarkable distance records. "Re-radiation" is practically eliminated. Responds to all broadcast wave-lengths—operates on any ordinary antenna, outside type preferred.

The cabinet is built of mahogany and follows dignified, harmonious lines that give it a pleasing appearance and make it an attractive addition to any home. The arrangement of the panel is the result of considerable study—it is placed at a height and angle that are new and provide an unusual degree of ease, comfort and precision in tuning. Dials, knobs and tubes are symmetrically arranged and tend to enhance the already attractive appearance of the receiver as a whole.

Model V is an entirely new development in radio science—it is unusually simple to operate, very selective, has high electrical efficiency, presents a pleasing appearance and sells for only $125.00, completely equipped with all tubes, dry batteries, Kennedy 3,000-ohm phones, with plug. This unquestionably stamps it as the one striking value in the radio field.

Ask your dealer to show you the new Kennedy Radio Model V—or write us direct for fully illustrated literature. Other Kennedy models in period furniture designs range up to $825.00 fully equipped, including built-in loud speaker.

THE COLIN B. KENNEDY COMPANY
SAINT LOUIS SAN FRANCISCO

All Kennedy receiving sets are regenerative.
Licensed under Armstrong U. S. Patent No. 1,113,149.

KENNEDY

The Royalty of Radio

Brandes

Table-Talker

TRADEMARK REG. U.S. PAT. OFF.

Everybody-listen in!

"Tune" with your *Matched Tone* Headset. Then let the family listen with a Brandes *Table-Talker!* The perfect combination for *real* radio fun!

The new *Table-Talker* does for group-listening what the *Matched Tone* Headset does for the individual.

It provides true tone—mellow and strong. It reproduces the program faithfully—from the deepest speaking voice to the highest instrumental music. And it's a good-looking addition to any set—with its simple lines and neutral brown finish. A *remarkable* loud-speaker!

$10

50c additional West of the Rockies

All Brandes' Products are sold under a money-back guarantee

C. BRANDES, Inc., NEW YORK

Matched Tone

TRADE MARK REG. U.S. PAT. OFF.

Radio Headsets

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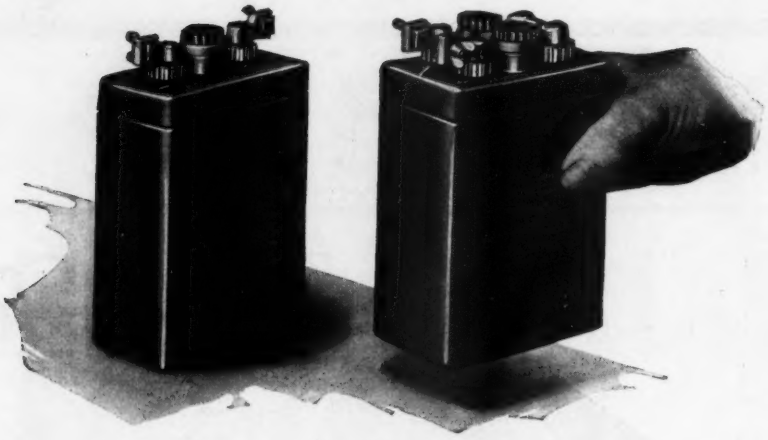


What you have been waiting for

HERE are two rugged little storage batteries designed particularly for low-voltage tubes. Although they weigh only 5 and 6 pounds, they are of true Exide quality. Highly efficient and with ample power for long-distance receiving, these batteries will give you a type of service that you would find it hard to duplicate.

These sturdy little batteries are neat and compact. They were specially designed for WD-11 and UV-199 vacuum tubes, but can be used with any low-voltage tube. The two-volt Exide A Battery consists of a single cell. It will heat the filament of a WD-11 or other quarter-ampere tube for approximately 96 hours. The four-volt A battery, having two cells, will light the filament of a UV-199 tube for 200 hours.

For six-volt tubes
Like all Exide Storage Batteries, the Exide A Battery for six-volt tubes is dependable and long-lasting. It is made in four sizes, of 25, 50, 100, and 150 ampere hour capacities.

Service you will appreciate

Exide Radio Batteries are carefully constructed on sound engineering principles. They give the kind of service every radio fan would like to get from his storage battery.

As you know, any variation of current in the plate circuit produces weird sounds in your phones. With an Exide B Battery hooked up to your set, static is the only undesirable sound you will have to contend with. The Exide B Battery supplies steady, noiseless current. It permits the niceties of adjustment that make radio receiving an unalloyed pleasure.

The Exide A Battery for six-volt tubes has extra-heavy plates, assuring constant potential and uniform current over a long period of discharge. Like all Exide Batteries, it embodies the finest materials available.

Exide B Batteries
give noiseless, full-powered service over a long period of discharge. Designed throughout to prevent electrical leakage. Capacity, 3 ampere hours.

In marine and commercial wireless

On sea and on land the Exide plays an important role in the industrial life of the nation. In marine wireless, Exide Batteries provide an indispensable store of emergency current. A majority of all government and commercial wireless plants are equipped with Exides.

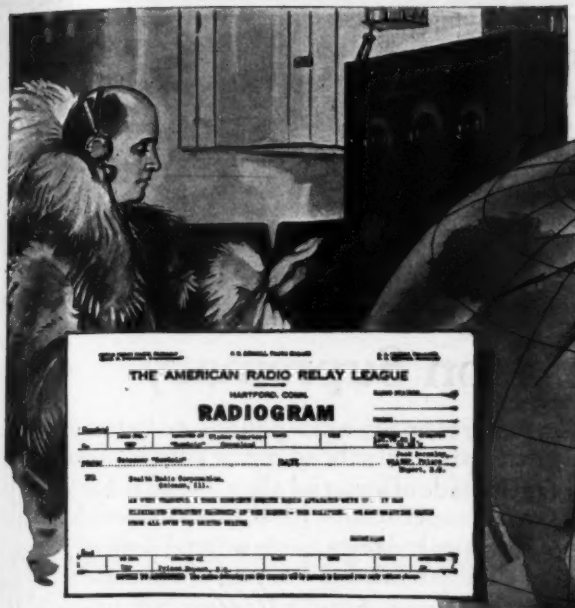
Exide Radio Batteries are sold by radio dealers and Exide Service Stations everywhere. Ask your dealer for booklets describing in detail the complete line of Exide Radio Batteries. Or write direct to us.

Exide
RADIO BATTERIES

THE ELECTRIC STORAGE BATTERY COMPANY, PHILADELPHIA

Oldest and largest manufacturers in the world of storage batteries for every purpose

Service Stations Everywhere — Branches in Seventeen Cities



ZENITH

Licensed under Armstrong U. S. Patent No. 1,113,149

AT THE NORTH POLE

Inside the Arctic Circle, nine degrees from the North Pole, a little 89-foot schooner is frozen fast in the ice of Smith Sound. Aboard this schooner a group of brave men are enduring, as best they can, the desperate cold of the Arctic—cold that often drops to 60 degrees below zero. Human atoms in a boundless field of ice!

Cold is hard to endure, but far more terrible is the Arctic solitude—unbelievably oppressive. Radio, at length, has broken this spell forever!

Concerts from Honolulu!

Daily, by means of powerful sending and receiving apparatus, the crew of the "Bowdoin" are in communication with relatives and friends in the far-off States. Daily they listen to concerts as far away as Chicago, Dallas, and Honolulu!

When the sanity, the very lives of one's shipmates may depend upon contact with the outside world, none but the ***best*** is good enough.

Dr. MacMillan's Choice—the Zenith

Out of all the radio sets on the market, Dr. MacMillan selected the Zenith exclusively—because of its flawless construction, its unusual selectivity, its dependability and its tremendous ***reach.***

Already his operator, on board the "Bowdoin" ***in Northern Greenland,*** has tuned in several hundred stations. You along the Atlantic who brag a little when you tune in Catalina Island—what would you say if you tuned in Hawaii ***from the Arctic Circle?***

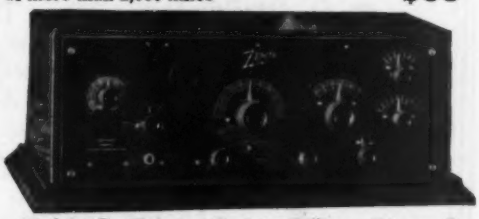
The set that Dr. MacMillan has is a standard Zenith receiving set. And you can do all that MacMillan does, and more, with either of the two new models shown at the right. Their moderate price brings them easily within your reach. Write today for full particulars.

Zenith Radio Corporation
McCormick Building
CHICAGO

Model 4R—The new Zenith 4R "Long-Distance" Receiver-Amplifier comprises a complete three-circuit regenerative receiver of the feed-back type. It employs the Zenith regenerative circuit in combination with an ***audion detector*** and ***three-stage*** audio-frequency amplifier, all in one cabinet.

Because of the unique Zenith "selector," unusual selectivity is accomplished without complication of adjustment.

The Zenith 4R may be connected directly to any loud-speaker ***without*** the use of other amplification for full phonograph volume, and reception may be satisfactorily accomplished over distances of more than 2,000 miles $85



Model 3R—The new Zenith 3R "Long-Distance" Receiver-Amplifier combines a specially designed distortionless three-stage amplifier with the super-efficient Zenith three-circuit regenerative tuner.

Fine vernier adjustments—in connection with the unique Zenith aperiodic or non-resonant "selector" primary circuit—make possible extreme selectivity.

2,000 to 3,000 Miles with Any Loud-Speaker

The new Zenith 3R has broken all records, even those set by its famous predecessors of the Zenith line. Satisfactory reception over distances of 2,000 to 3,000 miles, and over, is readily accomplished in full volume, using ***any ordinary loud-speaker.*** No special skill is required.

The Zenith is the only set built which is capable of being used with all present-day tubes as well as with any tubes that may be brought out in the future. The Model 3R is compact, graceful in line, and built in a highly finished mahogany cabinet $160

ZENITH RADIO CORPORATION. Dept. G
328 South Michigan Avenue, Chicago, Illinois

Gentlemen:—
Please send me illustrated literature on Zenith Radio.

Name .....

Address .....

AMPLION

The World's Standard Loud Speaker

Rubber Bushing Insulating Wooden Horn from Metal Sound Conduit
Metal Sound Conduit Highly Finished
Rubber Bushing Insulating Sound Conduit from Reproducer
Nickel Plated Hinged Stand for Lowering or Elevating Horn
Screw for adjusting diaphragm to meet all conditions of Rec. Sets

Amplion Deagon AR-19
$40.00

Phonograph Unit AR-35
$24.00

Amplion Beauty AR-13
$46.00

Amplion Junior DeLuxe AR-45
$26.00

A Few Practical Points About Amplion Supremacy

The Amplion requires no power amplifier—no battery. You simply attach it to regular head phone connections.

The diaphragm is made of a special alloy, found to have no equal after years of experiment with all other materials.

The electro-acoustical device is insulated entirely from the horn to eliminate distortion, ring or resonance.

Its Non-vibrating wood horn surpasses all other materials for true tone and clearness.

An Adjustable feature makes the Amplion sound true with any make of receiving set, and ensures faithful reproduction.

The Amplion mechanism is not new—it has not been hurriedly devised to meet the radio boom. Rather, it is a development, for radio purposes, of a loud speaking device used for years by leading Navies of the world.

The Amplion is manufactured by the oldest manufacturer of loud speakers in the world.

The Mahogany horn—the enameled sound conduit—the highly polished nickeled base—the reproducing mechanism—all are of the highest quality.

Ask your dealer for a demonstration.

Patentees: ALFRED GRAHAM & CO.

SIGNAL ELECTRIC MFG. COMPANY

Sole United States Distributors — **Menominee, Michigan**

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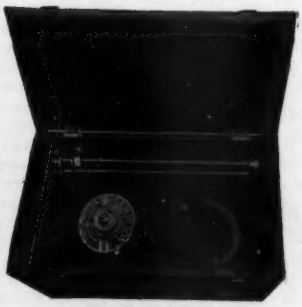
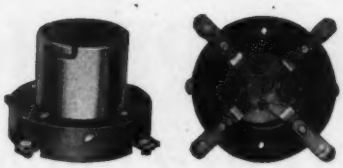


Amplion Portable AR-61
$50.00

Amplion Junior AR-39
$18.00

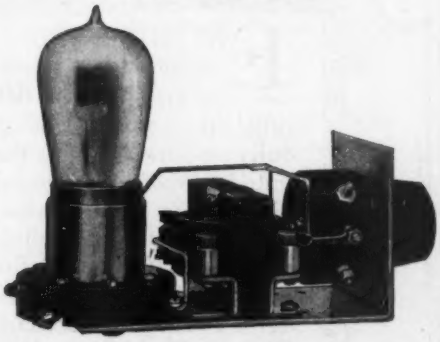
The Supremacy of The Amplion is The Supremacy of Actual Performance

A QUALITY SOCKET plus A QUALITY TRANSFORMER



PLUS A
QUALITY
RHEOSTAT

MAKES A
QUALITY
AMPLIFIER



AND MADE BY

AMPLIFICATION

by General Radio amplifying units saves time, money and patience.

They give satisfactory, distortionless volume and a lifetime service.

Guaranteed

Types	*Prices*
300C for U V 199 tube - - -	$7.75
300D for U V 201A tube - - -	8.25

Write for free descriptive bulletin 916W

GENERAL RADIO CO.

Manufacturers of

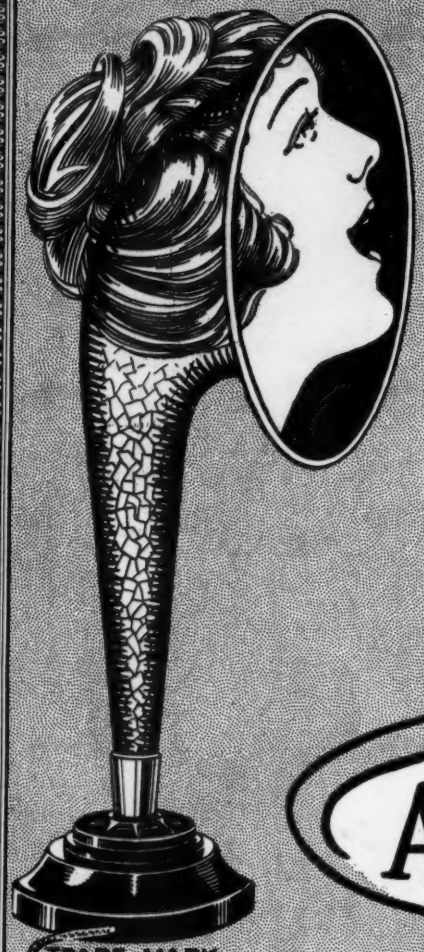
Electrical and Laboratory Apparatus

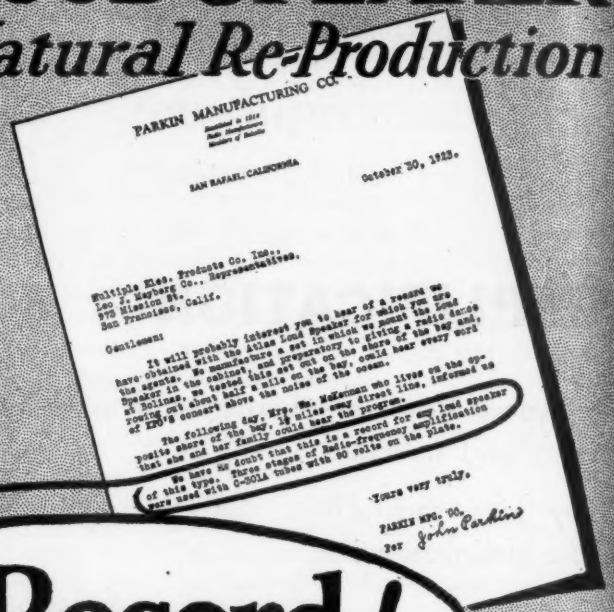
MASSACHUSETTS AVE. and WINDSOR ST.

CAMBRIDGE, - - MASS.

Atlas LOUD SPEAKER

Natural Re-Production




PARKIN MANUFACTURING CO.

SAN RAFAEL, CALIFORNIA

October 30, 1923.

Multiple Elec. Products Co. Inc.,
Leo J. Meyberg Co., Representatives,
870 Mission St.
San Francisco, Calif.

Gentlemen:

It will probably interest you to hear of a record we have obtained with the Atlas Loud Speaker for which you are the agents. No manufacture a set in which we mount the Loud Speaker is the cabinet, and preparatory to giving a radio recital at Bolinas, we lashed half a mile out on the bay, and the rowing out about half a mile on the bay, could hear every word of KPO's concert above the noise of the ocean.

The following day, Mrs. Mc. McKeeman who lives on the opposite shore of the bay, 12 miles away direct line, informed us that she and her family could hear the progress.

We have no doubt that this is a record for any loud speaker of this type. Three stages of Radio-frequency amplification were used with C-301A tubes with 90 volts on the plate.

Yours very truly,

PARKIN MFG. CO.
per John Parkin

A Record!

ENTHUSIASTIC TESTIMONY straight from an impartial authority. Re-Production is a *fact*. The delicate overtones which give music its roundness, resonance and timbre, are faithfully re-born through the modern magic of the patented "double diaphragm." This extremely responsive device is adjustable to the exact requirements of your set and individual receiving conditions. *Write for Illustrated Booklet "C."*

Atlas Loud Speaker Unit

With Phonograph Attachment..... $13.50
Without Phonograph Attachment..... $12.50

Letters from Users Requested

What have you accomplished with your Atlas Amplitone? Tell us about it.

Sole Canadian Distributors
The Marconi Wireless Telegraph Company of Canada, Ltd., Montreal, Canada

Ask Your Dealer for a Demonstration

List Price Complete

$25

Multiple Electric Products Co. Inc.

ORANGE ST., RADIO DIVISION NEWARK, N. J.

HIRAM PERCY MAXIM, PRESIDENT
CHAS. H. STEWART, VICE-PRESIDENT
F. H. SCHNELL, TRAFFIC MANAGER
A. A. HEBERT, TREASURER
K. B. WARNER, SECRETARY

THE AMERICAN RADIO RELAY LEAGUE

EXECUTIVE HEADQUARTERS
HARTFORD, CONNECTICUT

OFFICIAL ORGAN: QST
KENNETH B. WARNER, EDITOR

Experimental Radio Station 9BP
Prince Rupert, B C Canada.
September 26th, 1923.

Messrs. Adams Morgan Company,
Upper Montolair, N. J.

Dear Sirs:-

I have advised you before that I am very pleased with the results of my "PARAGON APPARATUS" but here is another victory for "PARAGON APPARATUS" which I feel you will be interested to know.

The MacMillan Arctic Expedition which left Wiscassett, Maine on June 23rd. on board the radio equipped Schooner "Bowdoin" planned to keep in touch with the outside world by amateur radio. This they were able to do until they got North of Disco Island, Greenland. After going North of that point nothing was heard of the expedition. And all interested became worried at the ship's apparent silence. The Chicago Radio Laboratory on this account offered a duplicate of the receiving apparatus aboard the "Bowdoin" as a prize to the first amateur to get into communication with the Arctic Expedition. This prize I have had the honor to win with the aid of my PARAGON Type RA-10 Regenerative Receiver and PARAGON Type DA-2 Detector-Amplifier.

Since first getting into communication with the "Bowdoin" expedition(who are in winter quarters frozen in at Refuge Harbour, which is ten miles North of Greenland Latitude 78.30 North, Longitude 72.30 West) on September 7th. I have had a working schedule with the operator and have copied one 600 word and one 181 word press message from them addressed to the New York World, together with dozens of private messages from the expedition and a complete list of amateur calls heard (a total of 548 calls) by the "Bowdoin" from July 28th to September 20th. and have forwarded all of these messages to their destinations.

When you consider that the expedition has heard hundreds of amateur stations in the Arctic but that my station has been the only one with whom they have been able to communicate, I consider this quite a record for "PARAGON APPARATUS" and am glad to be able to advise you how proud I am of my receiving apparatus.

Yours very truly,
Jack Barnsley.

MacMillan's Link with Civilization

A Paragon Radio Receiver is the most dependable link between MacMillan's courageous explorers and a civilization eager to hear of their doings.

Read this letter from Jack Barnsley whose Paragon Receiver has been picking up these vitally important messages, picking up every one, and getting every word clearly.

A Radio Receiver could have no higher recommendation.

Illustrated Bulletins on Paragon Radio Products are yours for the asking.

ADAMS-MORGAN CO.,
8 Alvin Avenue,
Upper Montclair, N. J.

THE BURGESS "A" BATTERY
Introduces a New Silent Partner

Notice that: he's exactly my size—same height—same width — same weight. We look like twins. (He's good looking, too.) Look us over.

BURGESS is a big family. I have a lot of brothers. Perhaps the most famous of them is BIG BROTHER "B." He had the field to himself until Burgess introduced VERTICAL "B."

Now comes my new partner. He is VERTICAL "B" JUNIOR. He has the same 22½ volts of pep as the rest of the Burgess "B" family. He is quiet — never talks to himself, and he never lays down on the job.

Burgess calls us "Work-Mates." He ought to know. We are silent partners in your radio entertainment.

Your radio set is no better than your batteries. Without them would be like having a marriage license and no bride. One is *no* good without the other.

Try it tonight. I'll heat your tube filament while my twin partner takes care of the plate circuit.

A Laboratory Product

BURGESS BATTERY COMPANY

ENGINEERS - DRY BATTERIES - MANUFACTURERS
FLASHLIGHT - RADIO - IGNITION - TELEPHONE
GENERAL SALES OFFICE: HARRIS TRUST BLDG., CHICAGO
LABORATORIES AND WORKS: MADISON, WISCONSIN

BRANCHES

NEW YORK	BOSTON	KANSAS CITY	MINNEAPOLIS
WASHINGTON	PITTSBURGH	ST. LOUIS	NEW ORLEANS

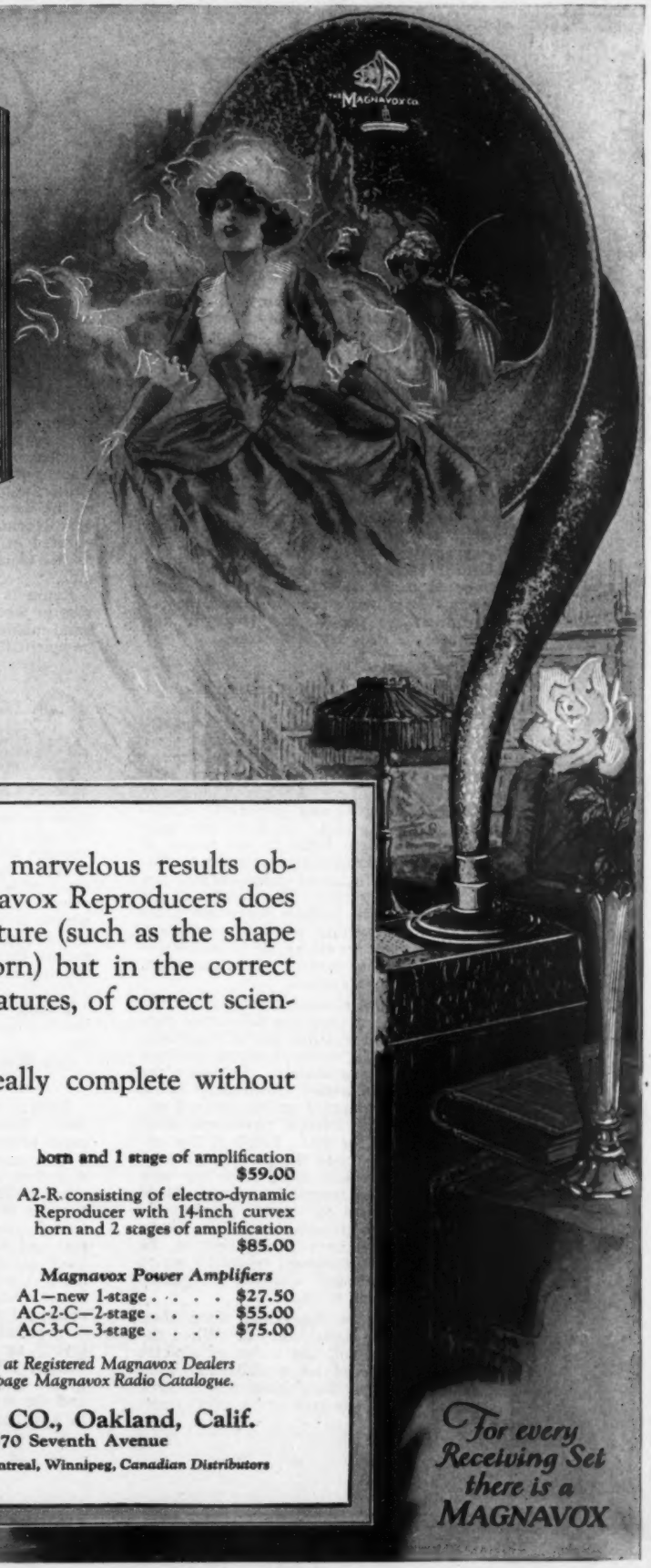
IN CANADA
PLANTS: NIAGARA FALLS AND WINNIPEG
BRANCHES: TORONTO MONTREAL ST JOHN

"ASK ANY RADIO ENGINEER"

BURGESS
RADIO BATTERIES

In an easy chair at home MAGNAVOX *gives you the melody of concert and opera*

MAGNAVOX
Radio
Reproducers and Amplifiers



THE secret of the marvelous results obtained with Magnavox Reproducers does not lie in any *one* feature (such as the shape or material of the horn) but in the correct working out, in *all* features, of correct scientific principles.

No receiving set is really complete without Magnavox.

Magnavox Reproducers

R2 with 18-inch curvex horn **$60.00**
R3 with 14-inch curvex horn **$35.00**
M1 with 14-inch curvex horn. Requires no battery for the field. **$35.00**

Magnavox Combination Sets

A1-R consising of electro-dynamic Reproducer with 14-inch curvex horn and 1 stage of amplification **$59.00**
A2-R consisting of electro-dynamic Reproducer with 14-inch curvex horn and 2 stages of amplification **$85.00**

Magnavox Power Amplifiers

A1—new 1-stage **$27.50**
AC-2-C—2-stage **$55.00**
AC-3-C—3-stage **$75.00**

Magnavox Products are for sale at Registered Magnavox Dealers everywhere. Write for new 32-page Magnavox Radio Catalogue.

THE MAGNAVOX CO., Oakland, Calif.
***New York Office:* 370 Seventh Avenue**
Perkins Electric Co., Ltd., Toronto, Montreal, Winnipeg, *Canadian Distributors*

IR

For every Receiving Set there is a MAGNAVOX

Editorial Chat

"SAY, Bill! Go to the Show?"

"Chicago? Betchalife. Everybody went. Great stuff. Best radio show ever."

That seems to be the common assent; best radio show ever. The great middle west is thoroughly responsive today to the appeal of radio, and the Chicago Show must be taken full stock of in all its interesting incidents, as an index of radio progress.

* * *

WITH Radio Broadcasting already developed into a mighty nation-wide agency, we are approaching close to an important political campaign in the course of which the political possibilities of broadcasting will be surely exploited to the utmost. Who can guess what the ultimate result on our political machinery and our national character will be? The political strength of the Roman Empire was cemented in its splendid system of communications. It is many removes from the relays of runners on the Roman roads to the broadcasting of a President's Message.

* * *

HELP Wanted: Licensed radio operator by X Y Z Airline Co.

Shall we see columns of this advertisement in the newspapers of tomorrow?

When industry takes a leap ahead of progress it is time to hot-foot for a telescope with its focus set on the future. An Akron company has purchased all rights and patents to manufacture Zeppelin dirigibles. Back of this bold venture lies a confident belief in the future of the dirigible as a commercial practicality. Radio lends a two-fold factor of probability to the success of the enterprise. The safety of air travel will probably be largely dependent upon radio reports of prevailing weather conditions. Furthermore, regular travel by air is inconceivable without perfect control communication, which radio alone can furnish.

The lack of natural obstacles away from the surface of the globe, if only the difficulties represented by wind and weather can be overcome, gives possibilities of a mode of travel untrammeled by expensive installation. Compare the limitations of the highway, continually being worn away by the stream of traffic jammed uncomfortably within its narrow pavement—with the wide avenues of the air! Think of the advantage of traveling above the pounding waves through which the vessel must plow her way with the expenditure of tremendous power. Once we grant that air travel on regular schedules is assured—and we are promised by this Akron enterprise that it is—there is no limit to the evolution which will ensue—an evolution which will involve undreamed-of changes in human institutions and modes of life.

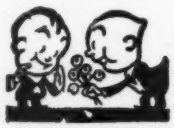
Railway systems are dependent upon their perfect and elaborate signal control. When the day shall come that will see trains of air-cars traveling at great speed on established routes and schedules, Radio, furnishing the control, will be called into a new task and a new opportunity.

"WHY continue to preach to a handful of people when by advertising and modern business method you can get a crowd?" So a divine is reported to have exclaimed in an address at the New York City Club recently. Why go to such length to collect a crowd in the name of religion and for the exercise of its various forms, when broadcasting will send into the homes of the land, where they will be received by the callous- and worldly-minded as well as by the bedridden and helpless, messages of faith and hope and charity straight from the finest religious minds?

Many churches are broadcasting their services as a regular institution, and even a report has reached us of one small rural parish which has dispensed with the service of a preacher and gathers together in its church building to listen to the service of a metropolitan church. Only very recently a Bible Service bureau was incorporated at Columbus for the purpose of giving to the world a daily scriptural message by Radio.

Radio is no more commercial than the service in which it is employed. It is the newest hand-maiden of Civilization and its service will be spiritual as well as material.

* * *



A READER of THE WIRELESS AGE writes that he concurs heartily in the hope recently expressed in our editorial columns that B. C. L.'s would come across more generously and graciously with bouquets. He says, "I for one feel profoundly grateful for the joy and instruction that radio has brought to my home," and goes on to state that "rather than miss telling of my thankfulness I have placed near my set some personal postcards, on which is printed the form inclosed herewith, which can be mailed at once and their presence means that there is no delay or failure in attending to this duty."

.....

Thank you very much for the privilege of hearing you on the radio from station..... at.....p. m. Eastern Standard Time.

We especially enjoyed.....

Address.

Such a little thing to do! Yet how perfectly fine! Better get into line and get some postcards printed.

A couple of our readers have protested—and doubtless others have the same thought—that after mailing one's bit of enthusiastic appreciation to the broadcast station it comes rather as a freezing douche to receive in reply the formal and stereotyped: "We are glad to receive your comments and wish you would write us often, giving suggestions, etc." or perhaps no acknowledgment at all. We will ask such discouraged persons to try to picture the inside of a broadcast station with a very limited staff trying to bestow as much as possible of its budget into effective service and better programs and trying to keep from closing down and the reason for lack of individual replies will be apparent.

Specialists In SHAW Moulded Radio Parts

Moulded from

BAKELITE "SHAWLAC"

In Appreciation

BEFORE starting what unquestionably will be the biggest year in Radio, we want to thank our friends for their loyal support during 1923. We realize our indebtedness to them.

TRANSCENDING in importance our large modern plant, unexcelled equipment and the finest kind of a working force, our relations with those who buy our goods are the very foundation of our business. And so on the threshold of 1924 we pause to wish you all

A Most Happy and Prosperous New Year

1924 holds out wonderful promise to us all.

RADIO is growing—it is estimated that there are between four and five million sets in this country already.

And the farm field is only scratched—when it really opens up—look out.

Be ready for sales—bigger than you have ever had.

THE manufacturer of today should be planning ahead. His sales and production should be all laid out. Raw materials should be purchased, new machinery—new dies ordered and installed. Peaks and valleys of production and sales must be flattened out. We earnestly urge the necessity of all these things so as to prevent a repetition of delayed production and the resultant loss of sales.

OUR Sales Engineers are at your service. A card will bring one of them to your plant to talk over your problems and entails no obligation to you.

SHAW INSULATOR COMPANY

FOUNDED 1892

Works and Office
150 Coit St.
Irvington — Newark
N. J. U. S. A.

HENRY M. SHAW,
President

FRANK H. SHAW
Vice Pres. & General Mgr.

Making it Easy to sell *Crosley Products*

Back of the proven quality of Crosley Radio Receivers and parts is the consistent Crosley advertising which is educating the public to the merits of these instruments and creating an ever increasing demand for them. Above is reproduced a full page advertisement that appeared in December in the Saturday Evening Post, Country Gentleman, Popular Mechanics, and all the leading radio publications. It is the first of a new series that is bound to bring big results.

If you handle the Crosley line, you are offering to your customers the best known, most successful line of radio products ever produced.

From the two-tube Crosley Model VI at $30 to the beautiful Consolette Model X-L at $140, we believe the Crosley receivers are the most remarkable sets ever offered to the public regardless of cost. The Model X (ten)-J illustrated above is a 4-tube set combining one stage of radio frequency, detector and two stages of audio frequency amplification.

CROSLEY
Better-Cost Less
Radio Products

Write for Complete Crosley Catalog, sending us the name of your Jobber.

An Enlarged Reproduction of the Page Advertisement Pictured above will be sent on request. It makes a very attractive Window Poster.

CROSLEY MANUFACTURING COMPANY

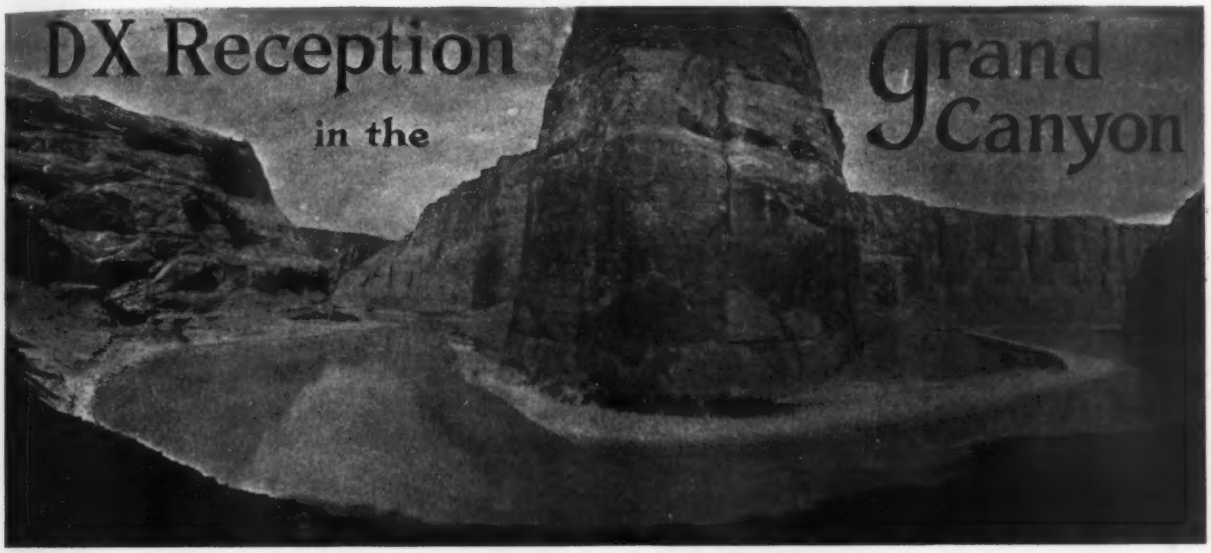
POWEL CROSLEY, JR., *President*

128 Alfred Street, Cincinnati, Ohio

THE WIRELESS AGE

"America's Foremost Radiophone Review"

VOLUME XI JANUARY, 1924 NUMBER 4



Colonel Birdseye's Exploring Party Keeps Radio Contact With the World While Thousands of Feet Down in the Canyon

By Max Abel

RADIO fans who sometimes complain of the difficulty of rigging an aerial on the top of a dwelling or even in the woods about camp by using tree tops as masts for the pleasure of picking up broadcasting, should listen to the story of DX reception in the Grand Canyon of the Colorado as told by Col. C. H. Birdseye, of the United States Geological Survey, who has just returned to Washington, D. C., after a trip of 300 miles through the roughest waters in that mighty chasm. The dominant purpose of the trip was to make an accurate survey of the canyon and to locate sites at which dams could be built to utilize the wasting waters for flood prevention, power development, and irrigation.

Colonel Birdseye tells a graphic story of the trip down the canyon, which was made in four wooden boats, supplemented by a canvas canoe. These boats carried all the supplies and instruments of the party and also, except at portages, the men themselves. In addition to the usual instruments used by engineers and geologists the party had a radio-receiving outfit—Aeriola, Sr.—which was modified for the trip by R. L. Atkinson, the expert mechanician of the Geological Survey.

On July 18 the party left Flagstaff, Arizona, the railroad station nearest to the point of departure, for Lees Ferry, 140 miles away. Here they remained, under stress and distress of a temperature that reached 110 degrees in the shade nearly every day, putting the boats and equipment in order.

On August 1 the party left Lees Ferry and camped that night at the head of Badger Creek Rapids, 7½ miles below Lees Ferry. Here the radio set was tried out, and in spite of adverse prophecies, some of them widely circulated in print, that a radio set could get nothing in the depths of the canyon, KHJ, at Los Angeles, was heard plainly, although the canyon here is narrow and nearly a thousand feet deep. From this point down the

Colonel C. H. Birdseye, Chief of the U. S. Geological Survey Grand Canyon Exploration party

The Grand Canyon Survey Party. Colonel Birdseye in center of picture

canyon the radio outfit was set up from place to place and received messages from Los Angeles, Salt Lake City, San Francisco, and on one occasion from Colorado Springs.

The radio outfit which enabled the party to keep in touch with civilization consisted of an Aeriola Sr., with two steps of amplification, using U.V. 201-A tubes throughout, which had been modified in the instrument shop of the Geological Survey to meet conditions which were to be expected in the canyon. This set, together with A and B batteries, was placed in a waterproof box, so that in the event of the overturning of the craft in which it was carried, there would be no danger to the instrument. The antenna wire, 150 feet in length, was carried on a small reel to facilitate winding on moving camp. Prior to breaking camp arrangements had been made with the Los Angeles Times (KHJ) and Desert News (Salt Lake City) (KZN) to broadcast items of interest to the party.

At Soap Creek Rapids, about 11 miles below Lees Ferry, camp was made where the party learned by radio of the death of President Harding, three-quarters of an hour after it occurred—probably before the majority of people of the United States had learned of it. Here the rim of the canyon is 3,000 feet above the floor.

On August 8, the boats passed Vasey's Paradise, 31 miles below Lees Ferry, so named by Maj. J. W. Powell, the first explorer of the Canyon, in honor of George Vasey, a botanist, who would have found the numerous ferns, mosses, and other plants here a very interesting study. The party filled their canteens, explored a large cave, made surveys of a possible dam site, and camped on the limestone ledges at the head of another rapids, where radio messages were received from KHJ at Los Angeles, though not without great static interference.

August 12, the party reached Nankoweap Creek and found a small stream of clear water—a decided luxury to men who had been drinking the water of the ever muddy river for nearly two weeks. In camp that night at the mouth of Kwagunt Creek the men thus camped in the depths of the canyon heard and enjoyed the items of the daily news and the baseball scores, as well as the fine concerts broadcast from Los Angeles. At this point the top of the canyon is 5,000 feet high.

FOR three months the intrepid Geological Survey Party, conducting their own 300-mile survey through the tortuous depths of the Grand Canyon, were able to keep continuously in touch with the civilized world through their radio apparatus. Three thousand feet below the canyon rim and hundreds of miles from the news centers, they learned of the death of President Harding three-quarters of an hour after the occurrence, probably before the majority of the people in the big cities knew of it. A mile deep in the great chasm they heard the news of the terrible earthquake in Japan. And finally, after months of trying adventures, they had the unique experience of hearing a broadcast announcement of the safety of their party.

VISITORS CAUSE COOK TO WALK OUT

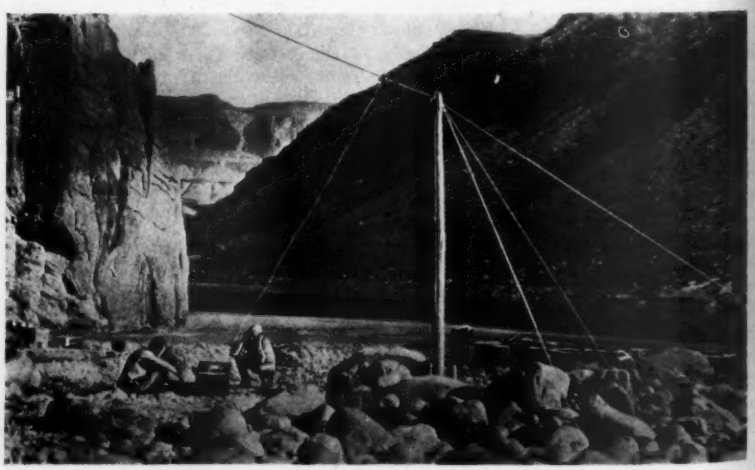
On the evening of August 29, the party camped at the mouth of Hermit Creek where a good flow of drinking water was found, and was joined by Colonel Crosby, Superintendent of Grand Canyon National Park, and a large party that had been made up to see the boats run Hermit Creek Rapids, the roughest kind of a stretch of water. The influx of so many visitors threw the cook "up in the air" and he threatened to leave the party at Bass Trail, the next stop. The party had been receiving radio messages about the impending coal strike, a threatened industrial and domestic calamity, and some of its members had vivid recollections of domestic trouble about cooks, but here was a "labor situation" right in the canyon that looked bad, and culinary service at once assumed a high value. However, as he was evidently to be lost to the party, a new cook was sent for.

For a number of days the radio outfit was out of commission due to a broken "pig-tail" connection on one of the rotors, but on the evening of September 8 at the mouth of Tapeats Creek, the radio outfit was again in use and KHJ came in clear. The party then heard that a serious earthquake had occurred in Japan and that the Washington baseball club had won a game. Here, too, the walls are nearly a mile high.

NEWSPAPERS TELL OF DISASTER TO THE PARTY

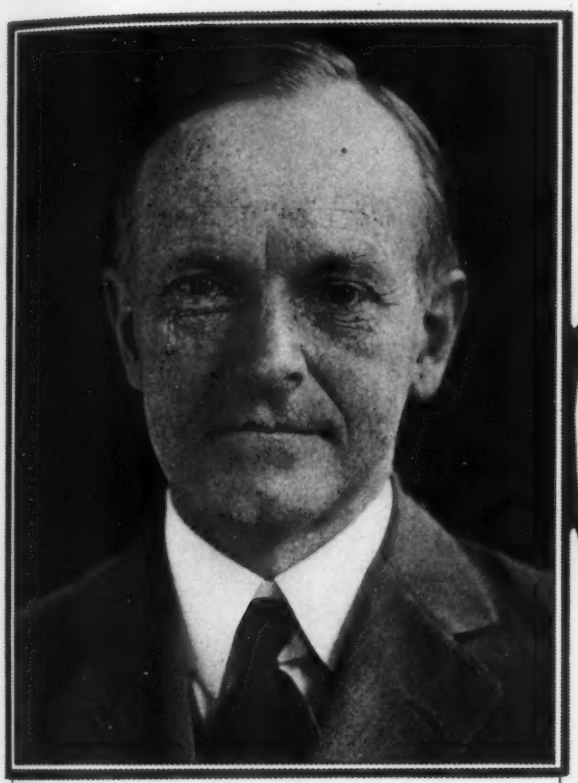
On October 2, after running many small rapids and escaping a 20-foot rise in the river, the party reached Diamond Creek, 164 miles below the

(*Continued on page 78*)

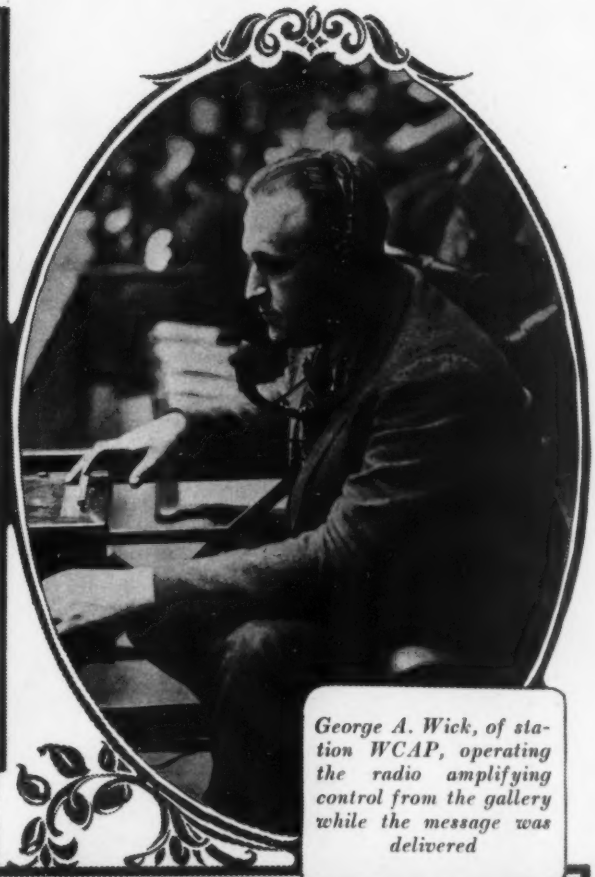


Trying out radio receiving set in the Grand Canyon

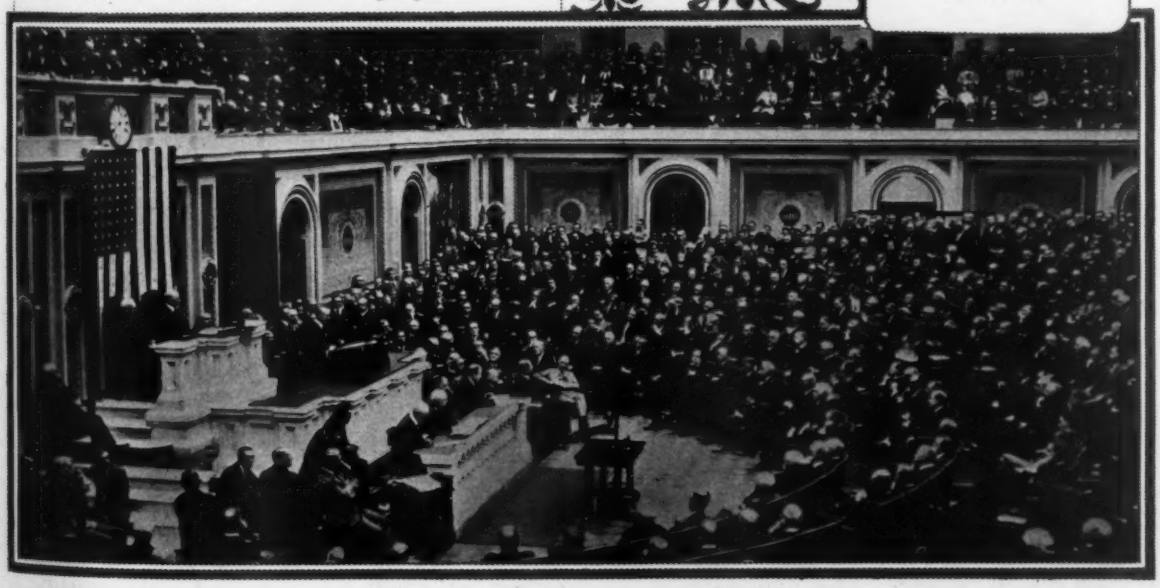
President's Message Broadcast



President Coolidge's first message to Congress, a pronouncement of tremendous political importance, was delivered direct to the country by radio



George A. Wick, of station WCAP, operating the radio amplifying control from the gallery while the message was delivered



While official Washington, including the representatives of foreign powers, crowded the galleries of the great chamber in which the Senate and House of Representatives were assembled at noon on December 6 to receive the President's message, radio fans all over the eastern half of the country listened to the address through their receivers

YASHA Bunchuk, solo 'cellist of the Capitol Theatre Orchestra which broadcasts such popular concerts. "Roxie" says this 'cello is worth $18,000, so no wonder this artist's music is so delightful

Some Interesting Broadcasters

Chief Crawler is ill at ease before the microphone. Read on page 27 how WJZ radioed his war-whoops

Here's the little chap with the big voice whose heart-throb songs delight listeners-in to Capitol Theatre concerts — Wee Willie Robyn

Florence Macbeth, leading coloratura soprano of the Chicago civic opera company, who has become a favorite with radio fans

World's Leaders Use Radio

Oscar S. Straus broadcasts his message on "A Constructive Program for Peace" from station WDAR, Philadelphia

The political arena is all set for 1924. Here we have Senator Hiram Johnson driving home his argument before the microphone

Mrs. Mary Roberts Rinehart, whose mystery stories, to say nothing of her lovable characters Tish and "K," are the delight of novel-readers over the English-speaking world, is shown here broadcasting her Glacier Park adventures from WJZ

Dr. Paul Kammerer, one of the foremost biologists, comes to America to explain his proof of Darwin's Theory of Heredity. Dr. Kammerer spends a few moments each day in radio diversion

Broadcasting Congress

Shall the Nation Sit in the Congressional Galleries?

By Otto Wilson

Not alone the President's message, but specialty important debates might be broadcast

WITH Congress again holding forth in Washington the idea recurs, "Why not install a broadcasting device in the Senate and the House and let the people of the country listen in on the proceedings of their political servants?" The present session promises to be filled with fight and excitement. The Congressmen from the Northwest are up in arms, and since they have the balance of power in both houses they are not going to be steam-rollered into silence. Then the issues that will be fought back and forth will play a large part in determining the success or failure of many presidential booms, including that of President Coolidge himself. What could be more interesting to the politically minded than to be able to pick up a receiver and hear Senator La Follette or Senator Magnus Johnson doing battle with Senator Watson or Senator Cummins on the question of guaranteeing the farmer a price for his wheat or of taking over the railroads of the country?

It could easily be done, but it probably will not be and for one very good reason—the country would be bored stiff in an hour. Usually we think of Congress as debating seriously the big questions that shape the country's destiny. Of course it does devote hours and days to the League of Nations, the revision of income taxes, and such broad subjects, and occasionally the visitor to the galleries is lucky enough to sit in on a tense and historic debate. But by far the greater part of

the time of Congress is spent in grinding laboriously along on plain government grist. Sometimes the proceedings are funny, once in a while highly dramatic, but most of the time they are just plain tedious. If, for instance, the eager political student in a back county in Indiana or Missouri could have picked up his radio receiver one day toward the close of the last session and listened to the oratory of the House, he might have been prepared to hear a profound discussion of our foreign relations or a ringing appeal for help to the farmer. But this is what would actually have assailed his ears:

"I notice every afternoon and every evening when we have a night session that shortly after adjournment the corridors are filled with smoke. I am

told that the smoke is emitted by the burning of refuse paper in some of the fireplaces here. I do not think that is a very sanitary plan. I do not think the corridors of the House should be filled with smoke, because rarely is the air from the outside allowed to come in here. I think that practice should be discontinued."

"I think that situation has been cared for. I am so informed."

"Oh, no. Only the night before last, when we ran until 11 o'clock, when I came over here from the House Office Building at half past 11 there was smoke in the corridors."

"I am sure the gentleman is mistaken about that. I think that must have been because of the members smoking as they were going out."

"Oh, no. I know the difference between cigarette smoke and smoke from burning paper. It is an abuse that should be corrected."

"The situation the gentleman mentions is an abuse and should be corrected, and I think it will be."

"How many chief janitors have we?"

"Just one as I understand it."

"They have one in the Senate drawing $2,000 a year; and we have one for the House drawing $1,800 a year. Is there one for the Supreme Court?"

"I was referring only to the House organization."

"This is just one Capitol building. Is there one for the Supreme Court?"

"Not a chief janitor."

"But there is a separate janitor for the Supreme Court."

"There must be."

"Then in one building we have three separate janitor forces. Why could they not all be put under one head, so that we would have only one chief janitor?"

"I think the gentleman might make that recommendation."

"It will cut out at least two positions as chief janitor."

"Does the gentleman think that the Senate would agree to do that? They want to control their own janitor force."

"If we called attention to it the people at home might persuade them to agree to it."

"Mr. Speaker, I ask for recognition in opposition to the resolution."

"The gentleman from Massachusetts."

And so on. We can imagine how absorbed the radio listeners would be in the question of smoke in the corridors of the Capitol and how quickly they would be aroused, as the worthy member of the House suggested, to rise up and demand that the Senate should stop immediately having a janitor all its own.

Of course there are occasions when the American people generally would give a good deal to hear what was going on upon the floor of the two houses of Congress. Thousands would have tuned in on that session in April, 1917, when war with Germany was declared, and there are many lesser occasions when the debate is tense, dramatic, and of the highest moment to the country. Probably after a while some arrangement will be made by which these special occasions will be provided for and the people will be enabled to hear history directly as it is being made. But for the present there apparently is no special demand for such arrangement and there is no plan to provide it.

One exception should be made to that statement. When Mr. Coolidge addressed Congress radio fans in the East were able to catch his words as he uttered them.

(*Continued on page 29*)

A 100,000 attendance marks the Chicago Radio Show as a big stride forward in the development of real popular interest.

The Chicago Radio Show

A week of high pressure Radio

As related by one of its conspicuous participants,

R. H. G. Mathews

AS we look back on the five days of November 20th to the 25th spent in the Chicago Radio Show, we have a vivid pulsing picture of surging crowds, flashing color, polished exhibits, attractive displays and energetic salesmen. From this jumble of impressions many high lights stand out.

In the first place, some idea will be gained of the size of the show from the total attendance, which was in the neighborhood of 100,000. And this crowd was more than a mere crowd of onlookers. It will be recalled that at previous shows the great general public paraded around, walked through such booths as were handy, with vacant looks on their faces, stuffed their pockets full of literature and wandered on out, without asking questions or displaying any particular interest. This year's show was different! The crowd came, poked its pencils inside of things, tore them apart and nearly mobbed the salesmen in attempting to secure information. This fact is best illustrated through the story of one of the larger exhibitors at the show, who started out with four salesmen in his booth the first night. The second night this same exhibitor had fifteen salesmen working in his booth and could have used more. This year's crowd did more than "look"; it wanted information. It was going to buy sets and wanted to know why it should buy any particular set, and it was there to find out.

BIRD'S EYE VIEW OF SOUTH HALF OF THE CHICAGO RADIO SHOW
The arrangement and preparation of the booths was attractive and well adapted to the purposes of the show. All the exhibitors felt well rewarded

Last year's attendance at the Chicago Radio Show was approximately 60 per cent. youngsters. An analysis of this year's attendance shows that less than one per cent. of the attendance was composed of children. Mr. Charles Hall, President of the Coliseum Company, in whose building the show was held, states that a greater number of automobiles were parked on the streets surrounding the Coliseum than have ever been so parked at any show ever held at the Coliseum, and in this connection it will be remembered that the Coliseum is the home of the annual Chicago Automobile Show, as well as many other great expositions.

From these facts it is very evident that radio *has come to stay;* that its appeal is now to the business man and his wife, that it has passed the "fad" stage, and has become a great settled industry, one of the greatest in the world.

Letters received by three Chicago broadcasting stations

KNOWLEDGE AMAZES

As soon as the doors opened at 2 p. m. the radio curious began to pour in, and at 7:30 p. m. the lines seeking to gain entrance were backed up for a great distance north and south along Wabash Ave., approaching the entrance.

The widest range of radio equipment was represented. The simplest bit of apparatus was on display, and at the other extreme were beautifully consoled and cabinetted sets running in price to $1,000 and more.

The crowd was made up of all sorts and ages of boys and girls, men and women. Exhibitors who were demonstrating expressed surprise at the knowledge of radio which the general public possesses. Young men and old men who admitted that they knew nothing of radio a year and a half ago were able to discuss sets and devices with fluent intelligence.

—From the *Chicago American*.

The exhibitor who pays good money to exhibit in a show is always inclined to be critical, and his judgment of the value of a show is therefore of considerable importance. The writer has yet to find one exhibitor at the Chicago Radio Show who is not clamoring vociferously of the tremendous value of this last Chicago Radio Show. Jobbers and dealers were there in profusion, and they were there to do business. They went through the show with a fine tooth comb, made their selections and placed their orders then and there.

SHIFTING OF LOUD SPEAKERS KEEPS CROWD CIRCULATING

Too much credit cannot be given U. J. Herrmann and James S. Kerr, who managed the show. It was the smoothest running exposition of its size that the writer has ever seen, and in this opinion the exhibitors are again unanimous. Demonstrations were not allowed. The show management installed and operated a concealed receiver, the output of which was supplied to banks of horns in various parts of the big hall, which is nearly 500 feet long and 200 feet wide. The music of the various Chicago broadcasting stations was brought in clearly and beautifully throughout the show. The squeals and howls of interacting receiving sets were absolutely absent. For the first time the public at a radio show really had an opportunity to hear for itself what radio music was like. Because of the fact that the receiver in operation was concealed, no manufacturer received any more credit for the demonstration than any other, and the crowd was kept in circulation by the switching of the reception from one bank of horns to another.

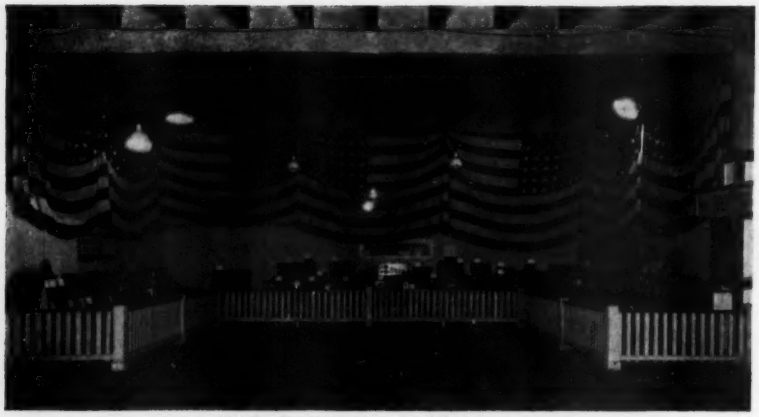
Some Crowd!

Not omitting The WIRELESS AGE booth, where our old friends met and new friends were made

OVER QUARTER MILLION REPLIES TO BROADCAST STATIONS

Great interest centered in the "Listeners Vote Contest" which was conducted during the week preceding the show by the three large Chicago Broadcasting Stations, KYW, WDAP and WJAZ. The listeners of these three stations were asked each night to send in communications stating just what class of entertainment they desired most to hear broadcast. As an incentive to secure sufficient answers, so that this would not be a minority vote, over $5,000 worth of prizes were donated by the various exhibitors at the show. These prizes included 27 complete receiving sets of various types as well as accessories of all kinds. The replies as they were received by the three stations were numbered, and each night at 10 o'clock at the show drawings took place, 100 prizes being drawn nightly, the prize winners being announced by the three stations.

The total figure on the number of replies received by these three stations is stupefying. While we all realize the tremendous power of radio and radio broadcasting, until it is brought home forcibly to us in some such way as this, we really have no conception of its immensity. A total of 263,410 replies were received,



Entries in the amateur builders contest

of which 170,699 were received by WJAZ, 37,800 by KYW and 55,711 by WDAP. Assuming not over one person in fifty will take the trouble to send in a telegram or letter in a contest of this kind, apparently the three stations mentioned had a total audience during the week of 12,253,250. Ponder this figure for a moment and try to realize how many people it really represents, and then try and realize the power that such an audience will have along the lines of political and other efforts, if its power is ever consolidated and brought to bear on any one issue.

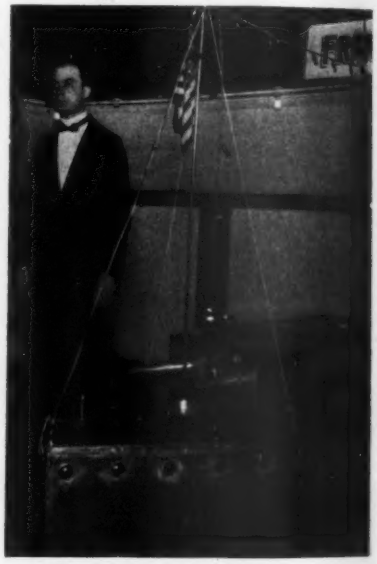
Another drawing card at the show was the hourly performance of Francill, the radio wizard, who demonstrated the most complete radio-controlled model ship that can be imagined. His thorough control of the ship was demonstrated by the fact that he could at will sound its horn, move it in various directions, right, left, front or back, light various lights all over the ship, ring its bell, release toy balloons imprisoned within it, fire its cannon, play a phonograph concealed within, imitating a ship's band, or do all of these things or any of them simultaneously.

In the theater at the south end of the exhibit hall were displayed continually various "Radio Movies," illustrating the principles of radio communication in sugar-coated form with a little comedy mixed in to make them palatable. Here also various well known radio engineers gave talks each night. Among the speakers were E. T. Flewelling of well known Flewelling "Flivver" circuit, Dr. Lee DeForest, Channing Pollock, well known author and playwright, William Schnell, Chief Engineer of the Electrical Research Laboratory of Chicago and others.

Near the theater were exhibited the various entries in the three amateur building contests. The first of these contests was unlimited, as to conditions, the prizes being $75.00, $50.00 and $25.00, respectively. The second contest was restricted to school children only, the prizes being five in number, $30.00, $25.00, $20.00, $10.00, and $5.00. The third contest was for sets of trick or novel construction, the three prizes being $20.00, $10.00 and $5.00. The judges, E. T. Flewelling, William H. Schnell of the Electrical Research Laboratory and R. H. G. Mathews of the Chicago Radio Laboratory, spent a great deal of time in carefully comparing the various exhibits. The first contest was won by a 12-tube Superheterodyne exhibited by Harry P. Kanuf, 718 Grace Street, Chicago, Ill. The second prize was awarded to Joseph Dorothy, 517 West 148th Street, New York, N. Y., who exhibited a three-stage radio frequency detector and two-stage audio frequency receiver.

The second contest was won by Ulysses Coates, 11733 Vincennes Ave., Chicago, Ill., and the third contest by John Neis, 1533 Wolfram Street, Chicago, Ill. No attention was paid to the type of circuit used in awarding these prizes.

The displays offered by the various manufacturers and dealers showed great originality, and many interesting and novel features. Our old friend Grebe drew tremendous crowds with a projecting machine which ran a film of his factory showing the processes of construction. The *Chicago Evening American* booth was built up in the form of a broadcasting studio, and in fact considerable broadcasting was done from the booth through the Westinghouse Station KYW, with which the American has a broadcasting agreement. Other Chicago newspapers were also represented by booths and exhibits.

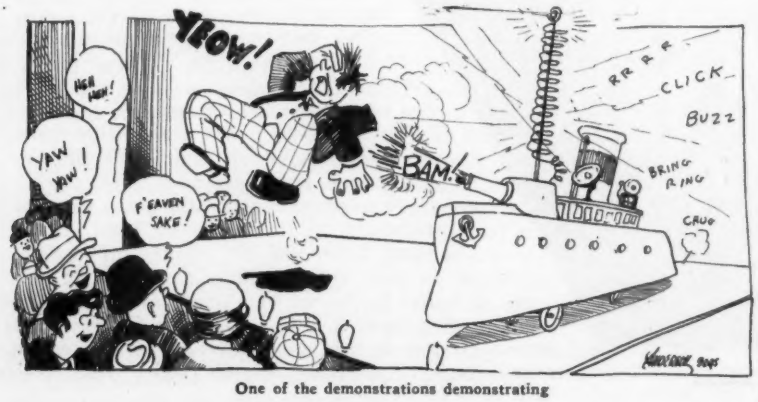


Francill and his ship

In the Commonwealth Edison booth was found a beautifully built white and gold Sleeper Monotrol Set, and near it was found the Tuska-Miner Superdyne Set which is attracting so much attention.

The honors for beautiful and expensive construction unquestionably go to Federal, who sent to the show under heavy guard a Sterling silver receiving set, the cabinet being beautifully hand chased and engraved, with solid silver knobs and controls throughout. This set occupied a glass case in the center of the exhibit hall and attracted much attention.

(*Continued on page 82*)



One of the demonstrations demonstrating

WHOOPS *of* Wild Rodeo Warriors Radioed From WJZ

As told by STUART HYDE HAWKINS

FOR the first time in a century or more the peaceful urbanity of thousands of homes throughout the eastern part of the country was rudely shattered by the gutteral gibberish and woeful wails of frenzied American Indians, for station WJZ broadcast the radio debut of the tribe of Flathead Indians who had arrived in New York for the Madison Square Rodeo, on Tuesday afternoon, November 13.

Under the guidance of Grey Scott, who escorted the tribe all the way East, the warriors arrived at the broadcasting station, and for once the soulful solemnity of the richly furnished studio seemed totally unsuited as the background of a radio concert—if concert it may be called—for the feather-filled head-dress and wampum-wound moccasins of the Chief of the Flathead Tribe and his chosen braves needed a far less civilized setting than is customary in Manhattan studios.

From the moment of arrival Scott's entire energies were directed towards keeping the descendants of the original Americans from either bolting outright or destroying whatever apparatus they could see, for the radio was to them a terrifying manifestation of the awful power of the Great Spirit. After considerable coaxing and coaching, Chief Michele Crawler, summoning by a visible effort his total reserve of chiefly courage, approached the microphone and hurled a short series of unintelligible grunts and growls into the ether, and Sam Vincent, who has mastered the lesser intricacies of American as it is spoken, was forcibly held by the redoubtable Scott while he murmured a weak—"Chief he say he glad be New York; like big totem-pole" (which Scott later assured us meant "skyscraper"); very pleased be here; don't like little box-on-stick-that-make-shout-you-hear-he-don't." By which we surmised that the Chief was not as enthusiastic about broadcasting as we might have hoped. "Chief he say—he say—" —here Scott gave him a forceful swift and silent reminder that he was addressing a half-million people and should realize the dignity of his position and cease stammering —"Chief he say damn lot more, he like New York, G'bye."

Chief Crawler (right) heaves a sigh of relief at having safely talked into the little box-on-stick, while Sam Vincent shows his bravery by touching the stand; Sam Nose looks longingly at the corner from which he has been dragged

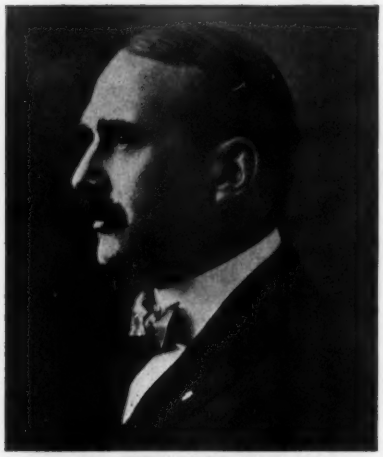
From the farthest corner of the studio emerged the corpulent form of Sam Nose, who had taken no chances while his comrades were addressing the "box-on-the-stick," and had retired to the most distant spot possible; and by the combined efforts of Eddie Paul, the Publicity Manager of the Rodeo—who was very evidently being cursed in every variation of the Flathead language for having conceived the broadcasting plan—and Grey Scott, he was shepherded to the side of his two brothers-in-misery at the microphone. From the announcer's station came the words "the Flatheads will now sing one of their war-songs—," and Sam Nose commenced a furtive pounding upon an immense tom-tom. After what seemed like hours, the Chief broke the vocal silence with a long-drawn, quavering wail which had more of the funereal than of the martial nature; a moment later Sam Vincent joined in—sounding for all the world like an uncertain "wandering saxophone" in a jazz orchestra—and gradually the volume swelled, the spirit changed, until under the stimulus of the tribal war-song their fear of the "box-on-the-stick" became a deep and abiding hatred for

(*Continued on page 82*)

Radio de Luxe

Messmore Kendall, Owner of the Capitol Theater, Prizes His Radio Sets and Places Them in Beautiful Surroundings

Interview by William A. Hurd



MR. MESSMORE KENDALL

A TWENTY-thousand-dollar radio set! And in a moment I was actually going to behold such a treasure!

After I waited, however, for well over two hours in the second room of the richly appointed suite which serves as an office for Messmore Kendall, proprietor of the Capitol Theater, while his secretary guarded the private sactum in a capable, pleasant manner, she arose quickly, motioning for me to follow. Walking through the third, and larger room, down a hallway and through another, still larger room, I was abruptly ushered into Mr. Kendall's private office.

A hasty glance revealed a spacious, well lighted room, luxuriously furnished, but in good taste.

Seated comfortably in an overstuffed chair I studied Mr. Kendall's features while he finished signing some papers. A strong, kindly face suggesting a keen sense of humor hardly betrayed the man of finance and power I had expected to meet. This was a man of vast capacity for the finer grasp of art and tradition.

I rather sensed that direct reference to the dollar value of his possessions would hardly gain his confidence.

"You have a very fine radio and I would like to know more about it," was my opening suggestion.

"Yes," he replied, becoming interested, "I have a set in my home at the top of this building, one at my Dobbs Ferry residence and another on my farm."

Here was a real fan! I asked him to tell me about them.

To begin with, his apartment, which comprises the entire upper floor of the Capitol Theater building, and is only accessible by means of complete identification, is distinguished by the most sumptuous furnishings. Rare period pieces, antiques and Oriental rugs decorate its high-ceiled rooms and establish an example of what can be done in the successful combination of luxury and comfort.

The radio cabinet, massive as it is, does not seem out of proportion with the other large pieces, all hand carved and individual. In fact, a grand piano, seeming at rest in one corner, is nearly obscure.

Mr. Kendall had hesitated for a moment, seeming to weigh the importance of details, but decided, he warmed completely to the subject.

"Upstairs," he began, "I have the set mounted in a fine old cabinet. In the evening I can tune-in on WEAF and hear the Capitol Orchestra playing. At the same time I can hear the music in a dictaphone which is connected to the orchestra pit by direct wire. Then, if I wish, I can open a window situated just above the theater through which the music comes direct from the instruments."

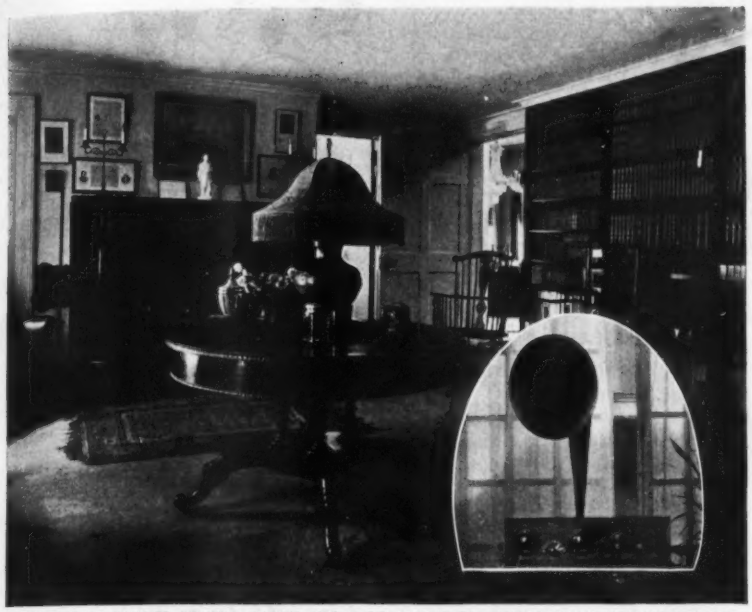
Messmore Kendall is a New York lawyer who conceived a beautiful idea. Recognizing the important place which the moving picture had come to take in all of our lives, he yearned to give the movies a setting worthy of the splendid productions which mark a continual progress in this art—a setting that would enhance their value. From this conception came the Capitol Theater, a grand home of the film-play, where thousands of people every day enjoy the unspoken drama in perfect comfort, surrounded by decorations of extraordinary beauty, and thrilled by a great orchestra of unusual quality.

As our interviewer has intimated, Mr. Kendall has some interesting hobbies which mark him as a man of broad and useful activities. His homes contain his considerable collections of rare paintings and antiques, which latter include a number of valuable Duncan Phyfe pieces. He is an ardent bibliophile and one of the illustrations with this article shows part of his library of 6,000 volumes, most of them first editions.

THE WIRELESS AGE identifies Mr. Kendall with the undeveloped future of radio as an agency of culture and entertainment. It is to men such as he in his Capitol Theater project has shown himself to be that we must look for many of the great ideas yet to be born that shall popularize radio and multiply its benefits. Radio needs the interest, enthusiasm and vision of big men and women.

A $20,000 RADIO CABINET

A corner of the living room in Mr. Kendall's home located at the top of the Capitol Theater building. The massive cabinet in the foreground to the right contains the wireless set on which he listens-in to the orchestral music that is transmitted by direct wire to WEAF, New York, and from there, broadcast to millions. The cabinet is a rare, hand-carved antique. In the background, between the fireplace and the clock, the paneling is actually a door opening on a private stairway leading to the theater



IN THE PRIVACY OF MR. KENDALL'S LIBRARY IN THE DOBBS FERRY HOME
The radio set, shown at the lower right hand corner, is kept in a closet located at one end of the room from where it may be enjoyed by opening the door. The circular walnut table, today occupying its original position, was used by Washington during his stay there

The Capitol, one of the largest theaters in the world, has a seating capacity of 5,000. The magnificent decorations mark it as a veritable palace for photo-plays. No introduction is needed here to the Capitol Orchestra, nor Rothafel, the radio impresario of the Capitol Theater, as both are well known to countless thousands throughout the country.

"The sensation of hearing the same music simultaneously," Mr. Kendall continued, "through three different mediums is certainly worth while."

And small wonder that he should be so enthusiastic over this, the child of his imagination.

I asked Mr. Kendall about the farm.

"On the farm," he answered, "I have a Radiola cabinet set that is easy for the folks to operate, but I have so little time to get away from New York I have to confine myself for the most part to listening-in upstairs or at Dobbs Ferry.

"At my home in Dobbs Ferry," he continued, "I keep the set, which is a Grebe, in a closet located at one end of my library. There I can enjoy radio in the home to the utmost."

Mr. Kendall was reluctant in answering questions concerning the history of this old Tory house in which George Washington planned the Yorktown campaign that brought to an end the American Revolution.

It was to this house, also, in 1783 that Washington again came to arrange for the evacuation of New York, and from which Washington and Governor Clinton, with their escort of troops under General Knox, took up the march down the old Post Road to re-enter the City of New York.

Originally a farmhouse of the picturesque Dutch Colonial type, its character has been faithfully preserved in the restoration. It illustrates two distinct phases of Colonial architecture and contains a rare collection of early American furniture and antiques.

Mr. Kendall, though a true fan, is less concerned with the technique of radio than the entertainment it offers

THE STAIRWAY IN THE DOBBS FERRY HOME
The original hand rail and spindles have been used in the restoration of this stairway. It leads to the upper hall, which has become a part of Mr. Kendall's library, where his radio set and the choicest of his six thousand volumes, most of them first editions, are kept. The Dutch chime hall clock, on the left, is dated 1686

when consummated by the influence of home surroundings. He has certainly placed the two together in perfect harmony. And probably because he recognizes in radio a permanent contribution to culture rather than a laboratory novelty.

Broadcasting Congress

(*Continued from page 23*)

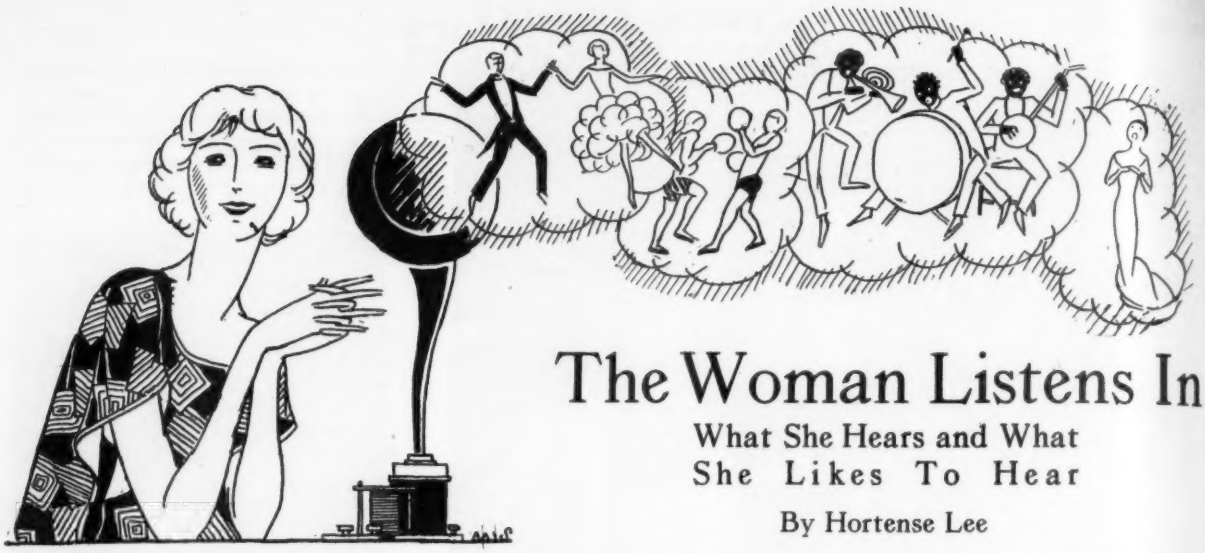
A device has been installed in the House of Representatives chamber for broadcasting the President's message. Anyone who has ever attended a session of the House knows that the chamber is so large and the confusion so great that it is hard for those in the galleries to keep track of what is going on, and the Speaker is constantly rapping for order so that the members themselves can hear. To help out this situation the Western Electric Co. a year or two ago volunteered to install an amplifying device similar to that used at big public gatherings. A cluster of horns was suspended from the ceiling, and they were connected with microphones on the Speaker's desk, the desk of the reading clerk, and the stands from which members make their longer speeches. These microphones can easily be connected with telephone wires running to sending stations in Washington or New York, from which the words of Congress can be sent flying out over all the Eastern states. It is of course mechanically possible also to link up sending stations all over the country by using the wires of the Bell Telephone Co., but that would require special arrangements between that company and the broadcasting stations as the company itself has stations as yet only in Washington and New York.

On December 6 the radio fans of the Eastern states were able to listen to the important pronouncements of President Coolidge, which may make history. But if they want to hear what Congress thinks of these and other weighty matters, as well as some which are not so weighty, they will have to come on to Washington and take a place in the galleries as heretofore.

Honoring a Forerunner of Radio

BRIDGING almost a century, the tinkle of a tiny bell, the first in the world that ever rang in response to an electro-magnet, was heard from coast to coast and across the Atlantic Ocean when programs in memory of Prof. Joseph Henry were broadcast December 17 from WGY, the General Electric radio station at Schenectady, N. Y., and WHAZ, the Rensselaer Polytechnic radio station at Troy, N. Y.

In 1831 Professor Henry discovered an electro-magnet by which he was able to transmit signals to a distance.



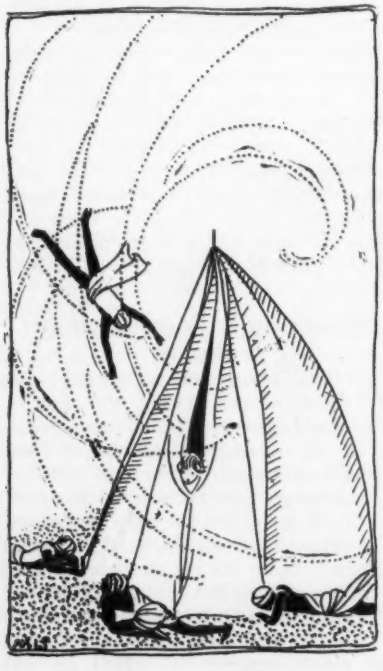
The Woman Listens In

What She Hears and What She Likes To Hear

By Hortense Lee

PERHAPS you think an Egyptian woman is a veiled, suppressed, secluded creature, still a century or two behind your modern suffragette. But if you listened in to WJZ, one evening in December, you heard of the famous "Ladies Wafd" of Egypt; of charming Egyptian ladies using the methods of western politics and suffragism; of street parades; of street harangues from a motor car; of boycotts. These are things the ordinary traveler misses in the Egypt of hotels and tourists' places. But they are part of the life Mrs. Grace Thompson Seton sees in her thrilling trips straight into the heart of the country.

Mrs. Seton told, in her radio lecture, of the political and social activities of the woman of Egypt. Told of her own adventures in a fierce simoon



of the desert, when all the tents were blown away but hers. Of how her tent was held fast to the sand by a man lying at each peg, tamping, tamping, tamping, all the night through.

The talk was a treat. But it had another interest quite outside itself. For it all grew out of an idea. It was the idea of Miss Anita Browne, Chairman of the Radio Committee of the League of American Penwomen. The League has a big, definite purpose, which it carries out in a big, efficient way. Part of that way, now, is by radio.

The League of American Penwomen, in case you do not know it, is a league of successful professional women. It has branches in twenty cities all over the United States. An important part of its purpose is to extend to young students the encouragement and help that will develop their abilities and show them the way to professional advancement.

Members who have gained fame as writers, lecturers, artists, musicians, give talks and conduct study groups for student members. There are poetry groups and short story groups, drama, scenario writing, music and art. All under well known women who generously give their time.

Now, through radio, the delightful entertainment of some of these groups, and the message of practical help and scholarships offered, will reach thousands who never before heard of the League of American Penwomen.

For the League's first radio evening Mrs. Grace Thompson Seton stepped out of a most impressive page of "Who's Who" to give her talk from WJZ. Mrs. Seton is vice-president of the National League and finds time in a busy life to serve generously in its activities.

That was the first talk. Then later in December, Mrs. Alice McKay Kelley spoke on "Christmas in the Philippines." Soon there will be more talks, from other stations, too, in different parts of the country, as the radio committee enlarges its range.

The idea of this radio committee, as an effective way to spread the impulse to creative inspiration among young writers and artists presupposes, of course, a large audience of women listeners everywhere.

When you cannot see beyond the microphone—when you cannot sense your audience—how can you know that women are listening-in the country over?

The question was put to WJZ. And the answer was in the letter files. There were hundreds of letters from women—perhaps thousands, if you counted them. Some of them are responses to talks specially planned for women—intelligent inquiries on the subjects discussed. Some of them are bits of enthusiasm or criticism.

The letters give real glimpses of home fun everywhere, and gradually shape, by the force of public opinion, the trend of broadcasting. Remember, there is no box office to indicate what the public wants—only the letters you send. And the woman's vote is as weighty as the man's.

What does the woman like, when she listens in? So far, you can only throw up your hands in despair at the puzzle. Read some of the letters that come to a single station—and you say, "Everything!"

One woman likes jazz music. Another wants less jazz and more classical music. One thinks prize fights are "just too brutal for words." Another writes to suggest that Major White be surrounded by a sort of telephone booth from which to talk, so that the cheers of the crowd can't drown a word of the broadcasting of the big fights.

A list of the things that "I especially

liked," copied from letters of women everywhere, includes the Hotel Commodore Orchestra, an organ recital, the Coast Artillery Band, a negro quintette, a sermon, a prize fight, bedtime stories, dinner speeches, stories of travels in Africa, violin solos, interior decoration talks. Almost everything on the broadcasting program.

One woman writes:

"My mother-in-law wants to know if you'll kindly try and play 'Beautiful Isle of Somewhere' on your wonderful organ."

And another:

"Please have just lots of dance music and please have the Blue Ribbon Syncopators again.

"Dorothy."

But the most universal picture is a home picture, with all the family listening-in—everybody applauding. Letters are signed "Mr. and Mrs. So-and-So." Or "The So-and-So Family." All together, they listen-in to the games. Mother acquires an eager interest in the sports her boys are following and soon becomes a baseball or a football fan. Sometimes she notes down the market reports and weather reports, for her farmer husband, to guide in his day's work, or the marketing of his products.

Here is a letter that gives a glimpse of the way radio quickly takes its place in the family circle. It came in response to the broadcasting of a Boy Scouts' program:

"You know I am a great friend of the Scouts. I have a boy, he belongs to the Scouts, and I never let him miss a meeting. It took two years for me to decide to have a radio set, but I certainly am not sorry; it passes our evenings away, the only trouble is we stay up too late. My husband always says just this one, but it's never the last one until late, but never mind, it's all right."

Many and many a letter comes in to tell of the helpfulness of lecture and sermon to women everywhere. One woman who never heard a lecture in her life found her comparative deafness overcome by the close-fitting headphones, and no longer misses the big news and the interesting speakers. The letters of listeners to the sermons are too many to quote. Here is one written to WGY that tells a story that is universal:

"Please accept our thanks for the privilege of listening to the church service this morning. Especially thankful is one member of our family—Mother Forrester, 73 and blind for the past ten years, weak from afflictions and unable to go out of the house to a service on Sunday for the past five years. She was an ardent Episcopal Church member in the past and sincerely hopes many other shut-ins have had the same good fortune to have listened-in this day."

And here's another letter:

"I drove 34 miles on Sunday to get a set working so the lady of the house could hear the afternoon sermon. After we got the set working, I wish you could have seen the expression on her face. This party is paralyzed and can't leave the house."

Women are critical—critical of the quality of the music, whether it is quality of jazz, or quality of classical music. They are critical, too, of the talks and lectures. There is always an audience for every type of program, but gradually the popular interest appears, shown in the type of criticism, and the number of letters of appreciation received.

A good example of the radio talk especially planned for women—a series with, presumably, a large audience—is the group of talks by Miss Harford, of "Harper's Bazaar." No man can quite appreciate the interest in the first news from the front—the front being Paris. "Harper's Bazaar" prints the fashion news "almost as soon as Paris knows it." And the radio talks tell that news often before the magazines are on the stand. What a scoop!

(Above). Black shaved lamb jacket worn over plaid frock shown at left.

Fresh Paris fashions are radioed from "Harper's Bazaar"

Take the three-piece suit, for example, with the three-quarter length coat. First news of its coming fashion importance was the sketch here reproduced from "Harper's Bazaar." But the news was permitted to leak out, first, by radio.

It is difficult to know who is listening-in, for there is no occasion for letter-writing, when the questions are answered in the talk. But sometimes a designer will stop in to ask Miss Harford to tell more than her brief lecture can reveal. Or a busy dressmaker, whose receiving set was not functioning clearly, comes to the magazine office to ask the names of the Paris-sponsored fabrics broadcast that week. Miss Harford welcomes these questions—and welcomes all letters—for they quickly show what sort of talks are most useful. And that is what she wants to know.

The future of broadcasting programs will be determined by the audience—and a large part of it by the feminine audience. "Give the woman what she wants," is the slogan. It's a hard enough task at best, as any man will tell you. How much harder, if you don't write, write, write!

Lucky Mayors!

IT is too bad that it is such a job to incorporate a city, otherwise probably about 99.44% of the American people would endeavor to become mayors. The reason is that the mayors of San Francisco on the Pacific Coast and New York City on the Atlantic Coast, have each been given a radio set. During their visit to San Francisco, last spring, Major General James G. Harbord and David Sarnoff, president and vice president of the Radio Corporation of America, discovered that Mayor Rolph of San Francisco had to use headphones when he listened in, using a set in his office. The Mayor now uses a Radiola Grand presented to the city by General Harbord. In New York City, Mayor Hylan also has been given a similar receiver.

From the Skies

MR. RIDOUX, an amateur of Garches, France, had the luck recently to find a meteorite weighing a number of pounds. In breaking it he noticed a number of sparkling particles, resembling the appearance of galena. A small piece of the visitor from the heavens was forthwith inserted in the crystal holder, the cat whisker adjusted—and signals heard. The material proved to be only slightly inferior to regular galena, but seemed to contain fewer sensitive points.

The Navy's Radio Net

135 Land Stations
More than 400 Ship Stations
$25,000,000 of Installation and Equipment
100,000,000 Words Transmitted Annually

"All's Well: Radio is at the Helm"

By J. Farrell

"PLEASE send destroyers, Yokohama. Americans in great distress—Bell." It was one of the early messages of the Japanese disaster, sent by Commander Bell in charge of the Naval Hospital at Yokohama from a Japanese warship, and received at San Francisco via Shanghai, the Philippines, Guam and Honolulu. The Asiatic fleet was at once dispatched to the scene to render aid to the sufferers. When Smyrna was burning, it was an American naval vessel that told the world by radio of the disaster. Help was summoned from all over the seas, and the American Navy saved thousands of Christian lives.

Visualize 135 radio stations dotting the Atlantic, Gulf and Pacific Coasts, and the island possessions of the United States. Add to the system more than 400 floating stations on as many naval vessels on the high seas. The result is a picture of Uncle Sam's vital nerve force without which in time of war the American Navy would be an unwieldly mass, and in time of peace ineffectual in protecting America's foreign commerce, in preventing maritime disaster, and in bringing succor to the distressed in shipwreck, earthquake, plague and famine. The navy's radio net covers practically the entire world.

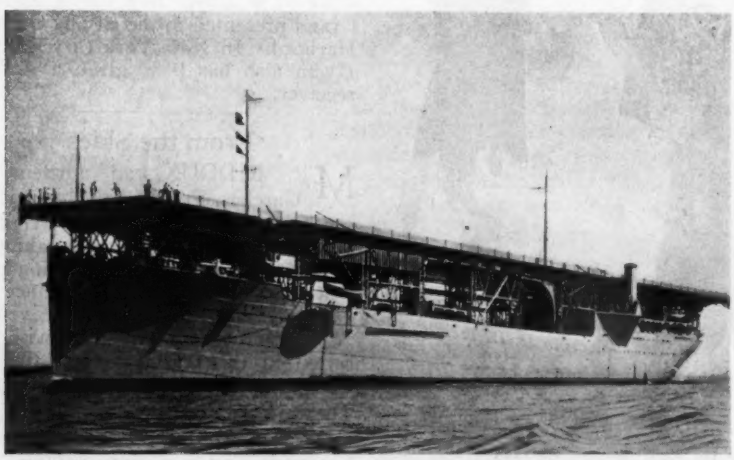
In protecting America's commercial interests abroad, radio has played a large part in directing the movements of naval vessels that patrol foreign waters. In the West Indies, for example, the navy has frequently landed men to protect the hemp, oil and fruit trade; in Cuba similar protection is afforded American sugar plantations; in the Near East the tobacco and petroleum trade on occasion have needed protection from local uprisings. The powerful radio station at Peking enables the Admiral of the Asiatic Fleet to keep in close touch with the American Legation, and to render prompt aid in protecting life and property from bandit hordes. Similar assistance is rendered at Constantinople.

. Monster radio antennae of the U. S. S. Colorado, the world's greatest battleship

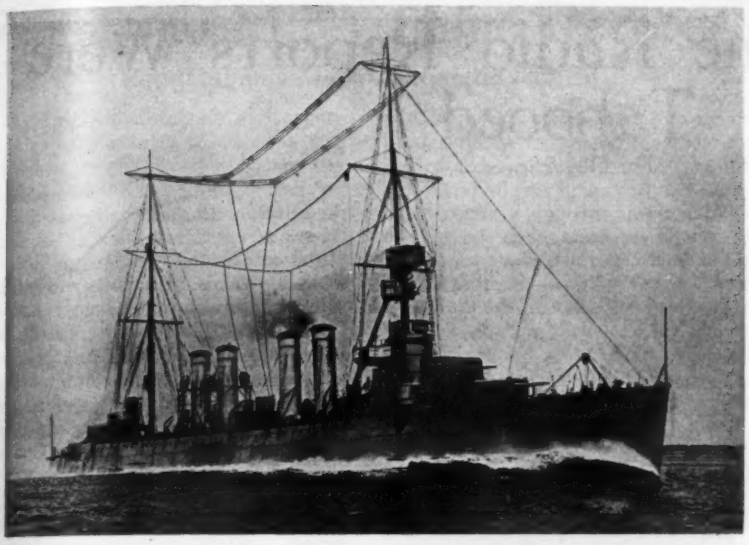
Every navy station is required by official order to listen for a period of three minutes every fifteen minutes for signals of distress on the high seas. When such a signal is heard the call, together with the position of the vessel, is broadcast on high power. Every naval unit in the vicinity of the disaster is rushed to the scene, directed from shore and ship by radio. Storm warnings are regularly flashed from the high powered shore stations covering a range up to 6,000 miles. The radio compass stations, of which there are more than 50 located at strategic points along the American coasts, have been the means of preventing heavy loss of ships and life in time of fogs, and other maritime emergencies.

The navy radio system is generally conceded to be the most comprehensive anywhere in the world. Along the coastal boundaries of the United States and island possessions there are 40 high power stations that work distances from 800 to 6,000 miles. These stations are supplemented by 95 intermediate stations with ranges up to 800 miles. Combined with the 400 or more ship stations and airplane radio equipment, the complete land, sea and air radio system represents an investment of approximately $25,000,000. The interplay of messages between stations aggregates 100,000,000 words annually. Most of the business is of a government or public nature, but 68 stations are also permitted to be used for commercial business by ships at sea. These stations handle an annual volume of 5,000,000 words.

The complete system is primarily organized as part of the nation's naval defense. "But in time of peace," declares Rear Admiral H. J. Ziegemeier,



The radio equipment of the new U. S. Navy airplane carriers includes the novel feature of two collapsible radio masts



Scout Cruiser "Detroit" hitting out for sea with all antennas spread

"the service has many ramifications. By extending a liberal use of the system to the press and business where it does not interfere with commercial companies, peoples all over the world are brought into closer contact and human understanding. Another important activity is to assist mariners by flashing out time signals, weather reports, storm warnings, hydrographic reports, and in transmitting S O S and signals of distress."

During the winter months the Alaska cable is frequently broken. In these emergencies naval radio provides the only means of rapid communication between Alaska and Continental United States. To handle the messages, stations are located at Sitka, Ketchikan, Seward, Kodiak, Cordova, Dutch Harbor and St. Paul in Bering Sea. Similarly, only one cable connects the United States with the Far East and is frequently out of commission months at a time due to coral formations on the bottom of the sea between Guam and Manila. To make up this lack the navy has several radio circuits across the Pacific, the giant of which is from San Francisco to the Philippines.

Navy stations are located at Honolulu, Guam and Cavite, and Tutuila in the Samoan Islands. The Cavite station is in sonstant communication with French Indo-China and the Dutch East Indies. Northward from Cavite are the circuits to Peking and Shanghair. Eastbound traffic is sent direct from Cavite to San Francisco. During the Limitation of Armament Conference two special circuits for government and press dispatches were set up between the United States and Japan. The northern circuit was between the Japanese radio station at Sapporo and the navy station at St. Paul. The southern circuit was used for one way traffic, Honolulu to Iwaki, and is still used for westbound messages. The Samoan circuit is made available for traffic to the Society and Fiji Islands, as well as to New Zealand and Australia.

In the Pacific the navy is permitted by law to handle press reports to practically any point, provided that one end of the deal is connected with American newspaper interests. This authority expires June, 1925. Under it news services in the Pacific are handled by the navy, the Associated Press sending an average of 1,000 words daily from San Francisco to Honolulu and about 800 words to Manila. The navy press rate to Honolulu is three cents a word and six cents a word to Manila. The navy handles all radio communications with the Philippines. Privately owned stations are not permitted to operate on the Islands.

On the eastern coast of the United States the main navy stations are at Bar Harbor, Maine; Sayville, L. I.; Annapolis, Md.; Arlington, Va.; Cayey, P. R.; Guantanamo, C. Z. and Panama. Bar Harbor is a receiving station for messages from Europe. the fleet in the West Indies and from the Pacific. Sayville is used as a transmitting station to the fleet and as a standby for Annapolis, both stations being operated by remote control from Washington.

During the troubles in the Near East, communication with the Admiral at Constantinople was had through Annapolis to Paris, leased land line to Coblenz, Germany, thence to Vienna, from Vienna by radio to a naval vessel in the Mediterranean, thence relayed by radio to Constantinople where the navy has a receiving station at the American Embassy and also a ship station. The return messages were similarly handled, being received at Bar Harbor, and then telegraphed by land line to the Navy Department at Washington. In later experiments, messages have been copied direct from Annapolis by the ship station at Constantinople.

The radio compass developed by the navy is regarded as the navy's outstanding contribution to the safety of navigation. A compass station is located within 100 miles of every important seaport in the United States. Storms frequently drive mariners 50 to 100 miles off their course, and in the ensuing cloudy or overcast weather

(*Continued on page* 68)

NAVAL RADIO SCHOOL AT GREAT LAKES

Here the raw "gobs" are made into radio technicians who hold the key to the Navy's nerve system

When Marine Radio Reports Were Tabooed

By Old Timer

STRETCHING northward towards New York City from the New Jersey coast which is dotted with merry and populous seashore resorts, there is a bleak, barren, sandy, narrow and generally unattractive neck of land known as Sandy Hook. At first glance one would say that this bit of land, several miles in length and but a fraction of a mile wide, is of no use whatsoever. Yet, jutting out into the ocean and embracing in its wide sweep a sheltered body of water which forms part of Lower New York Bay, Sandy Hook could not have been better designed for two purposes. It is ideal as an observation post for keeping tabs on incoming and outgoing shipping clearing the Port of New York.

Back in 1909, when radio communication had not been developed to its present high state of efficiency, there stood on the very tip of Sandy Hook a pair of tall towers. From some distance away, they seemed twins in architecture as well as in purpose; but when viewed at close range they were quite different. One tower was built of steel, while the other was built of wood; however, both towers were surmounted by small balconies and a complete circle of windows for facilitating observation out to sea. A keen observer could not fail to notice one or more long barrels protruding from the windows and balconies, which, in view of the military surroundings, might well be mistaken for machine guns or young cannons. But as a matter of fact they were merely telescopes of high power.

Now these towers were maintained by two rival telegraph companies for the purpose of reporting the ships passing Sandy Hook. The rivalry was of the keenest sort, for the telegraph companies secured patronage for their marine news service largely on the basis of their "scoops." In each tower there were several men on duty, ever on the lookout for signs of smoke on the horizon and ever ready with their powerful telescopes to identify the incoming ships by their funnels and superstructure. The instant a ship was identified, a report would be flashed by telegraph to the marine news bureau in New York City. For that purpose a battery of keys and sounders surrounded the observers in each tower.

The way the writer happened to come across the story which he is about to narrate was through a series of radio telephone tests then being conducted between Fort Hancock, Sandy Hook and Fort Wood, Bedloes Island, in the very shadow of the Statue of

Liberty and the very station from which the WVP radiophone programs have been broadcasted. The small Army boats plying between New York City and Fort Hancock are few and far between, and since the radio telephone experiments at that time never lasted longer than a few hours at a time—it was an ordeal at that period, rather than a pleasure—the writer found himself with plenty of time on his hands and not much to do. Hence in the course of his walks about the narrow strip of land, in which every feature of the military post had become quite commonplace and without further interest except for the big guns, and these had to be viewed from a distance because of the snappy sentries, the author quite naturally discovered the two towers and spent much of his time in one of them. And that is how he obtained the data for this little story.

Now it appears that the keen rivalry between the two observation towers led to more and more guesswork as regards the reporting of shipping, as might well be expected. At first the observers waited until a ship was well above the horizon, so that she could be viewed in her entirety without chance for mistaken identity. But with the ever-increasing urge for "scoops" the observers began to identify ships by means of their superstructure and funnels, the latter being generally of a characteristic color or design.

Then one of the observers hit upon the novel and bold scheme of utilizing radio. He installed a radio receiving set in his tower and was able to hear the ships reporting to Fire Island, some forty miles distant. Once the ships reported to Fire Island, it was a simple enough matter to compute the time required for the ship to come to the horizon of Sandy Hook. So in a short time the observer in question began to identify and report his ships as soon as a bit of smoke appeared on the horizon, while his rivals, in the other tower, had to wait several minutes longer until the funnel and superstructure of the ship came into plain view of the powerful telescopes. Obviously, our observer scored one "scoop" after another until the rival telegraph company must have been on the verge of panic; for how could the super-vision of the rival observers be accounted for?

Then one day the unexpected happened. After scoring one "scoop" after another until it became an established fact and no longer created wonder, our observer friend reported a ship by means of its smoke in the usual way. He had told the rival observers that he had developed a new method of identification by means of the smoke of the various ships, much to their incredulity yet leaving them very mystified as to the peculiar powers of our observer.

A bit of smoke marred the horizon, whereupon our observer friend telegraphed the report in the usual manner. He had heard the ship reporting to Fire Island an hour or more ago, and it was just a matter of routine. But when the ship came closer, our observer discovered, to his horror, that he had made a mistake. The ship, instead of being the ocean liner which he had reported, was a coastwise steamer which was swinging in from a course far out to sea. He had to telegraph a correction—a fatal thing in this line of reporting. The officials of his company, now aroused to the fact that some peculiar and quite fallible method must be at work in identifying ships by means of their smoke, investigated and discovered the radio receiving set.

4,500,000 Miles, Some Record!

Radio Signals Make Automatic Return

ENGINEERS of the Radio Corporation of America achieved a scientific feat recently, when by an arrangement of the controlling circuit of the longest commercial radio service in the world—New York to Warsaw, Poland—they were enabled to make automatic signaling a substitute for operators. Radio was made to control radio, and thus over an 8,500-mile circuit continuous signaling was produced without human assistance.

The experiments were conducted before General J. G. Harbord, President of the corporation, at 66 Broad Street. W. A. Winterbottom, traffic manager, was in direct charge, while at the Warsaw terminal a special squad of engineers of the company was present.

At noon, when the experiment was begun, telegraph signals looped the loop around the circuit of the two radio stations with the speed of light. Unassisted by operators, relays of radio waves continued for twenty-five seconds and covered a total distance of 4,500,000 miles (twenty times the distance to the moon) under automatic control that was initiated by the original impulse.

One can visualize this performance as a gigantic radio lasso, set in motion by a short impulse which entered the transmitting control apparatus and shot forward the first wave, successive waves automatically being released to loop repeatedly about the Warsaw station and Broad Street.

Again and again this original dot raced around the circuit without interference from man. After making forty laps around the course, passing through twenty-five vacuum tubes, ten relays, changing its wavelength eighty times—first a feeble line current, then a mighty electrical wave—the automatic sequence set in operation by the initial impulse became completely exhausted and the dot withdrew from the race. And all this happened in twenty-five seconds.

In other words, the original radio impluse unaided by man caused a signal to travel back and forth around the loop made up of wire telegraph lines and radio circuits at the rate of 186,000 miles per second, and since it continued this process for twenty-five seconds, it actually covered the astounding distance of about 4,500,000 miles.

Explaining the commercial significance of this scientific achievement, General Harbord said:

"We have thus achieved a double check in communicating by radio over our Warsaw circuit. Today's experiment makes it possible for us to know in an instant the condition of our circuits. The accomplishment means that messages can be checked as to proof of their receipt and accuracy almost instantaneously with their sending. In fact, we are able to know as much about the condition of the Warsaw circuit as the engineer there."

That Radio Jag

SOME English clergymen think that radio is enough to drive a man to drink. At least, that's the natural conclusion to draw from the fact that in Nottingham the ministers have protested to the authorities against the installation of radio receiving sets in the "public houses," or saloons. The saloon keepers are hurt and indignant, saying that they are trying to elevate the tone of their establishments by means of the radio programs, but the ministers insist that it is but an insidious and evil scheme to get the workingmen to drink more and more.

WE HAVE A SPECIAL ANNOUNCEMENT.

"A young man has been granted the privilege of broadcasting for ten minutes on a subject distinctly personal. It is not our custom to give permission for such a talk requested by a private individual, whose identity we cannot reveal. There are special circumstances in this case, and we hope you will bear with us, and listen to what Mr. I. W. A. J. as he prefers to be known, has to say. Mr. I. W. A. J."

Eric H. Palmer contributes to the February issue an unusual dramatic story of what I. W. A. J. broadcasted. The reader will stay with it to the end to find out what three leading men of Gotham did about I. W. A. J.

Our women readers and lots of other folk will welcome some information on how to house their radio sets in appropriate and artistic manner. Mr. William A. Hurd writes in the February number an illustrated article about the various styles of radio furniture.

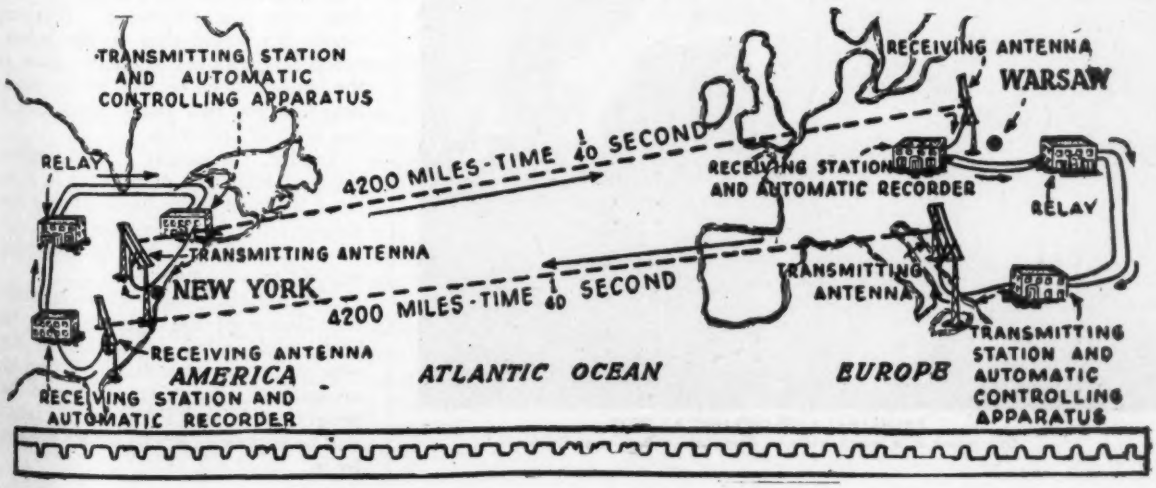
THE WIRELESS AGE REFLEX

Mr. John R. Meagher gives the readers of our February number an easy-to-make tuned R. F. reflex receiver that will be a worthy addition to the series of Wireless Age sets which include the "Push Button" receiver of this number and the "Uni-Control" of December. It costs about $10.00 to make this one-tube set which will operate a loud speaker at a range of 20 miles and has been proved for DX up to 1,500 miles.

Every radio fan wants to know about vacuum tubes—the different makes and their characteristics, what uses the different tubes are best adapted to and how to use them properly. The editor of THE WIRELESS AGE presents this information in a clearly understood article entitled "ALADDIN'S MAGIC LAMP" in the February number.

FOR THE BEGINNER IN RADIO

In February THE WIRELESS AGE commences Radio Engineering, an experimental home laboratory course in which the elements of radio will be presented in scientific but readily comprehended talks.



Peeps into Broadcast Stations

KYW Again Broadcasting Grand Opera Productions

RADIO fans who are music lovers will welcome the broadcasting by KYW, Chicago, of grand opera productions which began November 10th, when "Lucia Di Lammermoor" was sung.

The principals who sang Donizetti's beautiful score are: Giacomo Rimini, baritone; Florence Macbeth, soprano and Giulio Crimi, tenor, with Jose Mojica, Virgilio Lazzari, Elizabeth Kerr, and Lodovico Oliviero, singing in the lesser rôles.

The broadcasting of grand opera from KYW, Chicago, last year, when such brilliant voices of internationally famous stars such as Galli-Curci, Rosa Raisa and Mary Garden were heard over a goodly portion of the world, was a great accomplishment. The grand opera season last year was broadcast twice weekly during the ten weeks' engagement of the Chicago Civic Opera Association and the concerts were enjoyed by audiences which numbered more than a million.

The delight with which radio fans hailed this innovation was proved by a deluge of letters which came from every part of the country. These letters, many of which came from distant points, indicate that this development has served to bring residents of out-of-the-way and remote sections into close touch with culture, education and music, so that soon there will be little to differentiate the city dweller from those who live in the rural districts.

The grand opera productions were broadcast by means of a special sealed telephone wire connecting the stage of the auditorium with station KYW, which is located on top of the Edison Building, twenty stories above the busy Loop district.

PRINCIPALS OF "GO-GO" AT WGY
One reason it is worth while to Peep Into a Broadcast Station

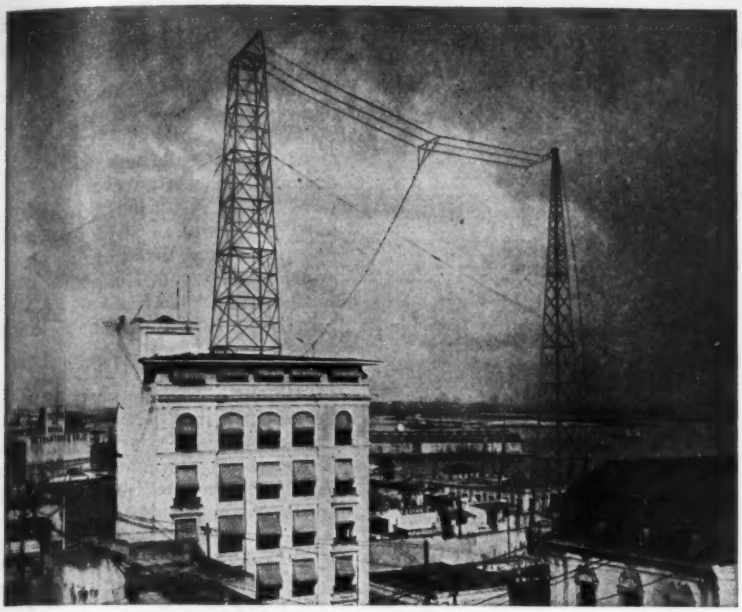
Reconstruction of CFCN

COMPLETE reconstruction of CFCN, the radio broadcasting station of the W. W. Grant Radio, Ltd., at Calgary, Alberta, Canada, has now been completed and CFCN is now listed as one of the most powerful stations on the American continent and the most powerful in Canada, having a modulating output power of 1,600 watts. It is now an eight and one-half kilowatt station.

"The Voice of the Prairies" was silent for two weeks while new equipment was being put in place, but when it resumed activities the added power and clarity of its signals startled radio fans throughout the United States and Canada, according to telegrams and postal communications of congratulation which commenced to pour in two days after the reopening. President Grant has stated that on the rejuvenated set he hopes to shatter some of the long-distance records he has established in the two years which CFCN has been in operation.

Twelve especially manufactured tubes of 500 watts each, made in Montreal, are now being used, while a new amplification unit designed and constructed by Mr. Grant is also being utilized to advantage.

The building from which emanates the "Voice of the Prairies" also has been made more capacious, so that now there is an abundance of room for artists, and it has been announced that programs from CFCN in the future will be supplied only by artists engaged by it.



IN THE TRADE-WINDS' CLIME
West Indies

This Is WKAQ, San Juan, Porto Rico

BROADCASTING Station WKAQ is located in the center of the city of San Juan, Porto Rico. Its owner The Radio Corporation of Porto Rico is affiliated with the International Telephone and Telegraph Corporation of New York, as is its sister station PWX at Havana, Cuba. The first broadcasting of WKAQ was done on August 26, 1922. The entire plant is installed on the top floor of the Porto Rico Telephone Co.'s seven-story building. The view from the towers, overtopping all the buildings of the city, gives a good impression of the progress of this island in every phase of civilization. On the roof of the telephone building a steel tower 87 feet high supports one side of the three-wire antenna that runs 90 feet horizontally to another tower 187 feet above the street level. The lead-in comes from the center giving a "T" type aerial.

The announcer in this particular station is the program manager and the general manager of the corporation. The announcer gives a few suggestions to the artist and moves the microphone to the proper place, opens the switch and announces: "This is WKAQ, Radio Corporation of Porto Rico, San Juan, Porto Rico, the Switzerland of America, where the best coffee grows. The next number on our program for tonight will be . . . One second please." This is repeated again in the Spanish language.

WKAQ has been heard in every state of the Union, Canada, West Indies, Mexico, Central and South America. Although the station broadcasts twice a week (Tuesday and Friday, from 9:00 to 10:30 p. m.) Porto Rico time, which is one hour later than 75 meridian time and four hours later than Pacific time, many letters have been received from California, Oregon and Washington, reporting reception of WKAQ during daylight.

Late Concerts From WBZ

PURSUING its policy of innovation in broadcasting and of service, station WBZ has arranged "late hour" programs. The purpose of these programs is to entertain the radio fans who are not at home in the earlier part of the evening, and to give fans located far away, particularly in the Middle West, a chance to listen to the Springfield station.

These late programs take place each week, on Wednesdays and Fridays, beginning at 11:00 P. M. On those evenings, WBZ is silent from 8:00 until 9:00 P. M. This arrangement is of course tentative, but will be continued if it receives the approval of the radio audience. The first late hour program was broadcast October 31.

The popular WBZ Trio, whose concerts have been enjoyed by thousands for the past few months will be augmented on "late hour" broadcasts with a clarinet and a flute, thus composing what will be known as the WBZ Quintette.

As will be remembered, the original trio consisted of a cello, violin and piano. It will retain its original form on Monday nights, but it will play compositions of its own on the nights when the additional instruments will reinforce the group of players.

In addition to the quintette, a soloist will take part in the evening's entertainment of the Wednesday and Friday late hour chamber music programs. This will afford a pleasing variety of music and will be well worth while staying up to listen to.

These late hour concerts are booked in response to requests from distant listeners, located especially throughout the middle west. As the station ordinarily completes its programs at about 9 o'clock, distant fans who begin listening at about this time, cannot hear it. Many local fans do not turn to their sets for radio entertainment until late in the evening. Giving programs at the period of from 11:00 to 12:00 P. M. eastern standard time should please both near and far away listeners.

HITCHY-KOO

RAYMOND HITCHCOCK
In Person
Doing his stuff at WGY. And the best part of it is, it looks just like him

Up–E–Nuf

WOC, Palmer School of Chiropractic

HOUSED in specially fitted rooms located on Up-E-Nuf, the roof auditorium of the school, the broadcasting apparatus and the studio equipment of WOC constitute the last word in modernity.

This station has been heard in Hilo, Hawaii, and officially reported as having been heard in Stockholm, Sweden.

Val McLaughlin brings the sandman to the kiddies each evening. The "Sandman's Visits" are chosen to please children from two years up to ninety, and include every kind of story, rhythmic poetry, nature, realistic and fairy tales. The fairy stories particularly appeal to the children between twenty-five and eighty-five or ninety years old, judging by the letters received.

Stanley W. Barnett, program director, is known as announcer BWS. The artist caught his pose just as he was about to make the opening announcements on one of the evening programs. Except for his shirt sleeves, Barnett is wholly informal in the conduct of the studio affairs.

On the other hand, Erwin Swindell, musical director, can hardly take things so lightly. Balancing wild jazz syncopation with a variety of classical numbers, solos, and orchestral renditions is no mean job.

WOC has received in one week as many as 12,000 communications from listeners-in within a radius of 4,000 miles. A telegram was received that read: "Radio broadcasting is the symbol of unselfishness."

The Personality of a Broadcasting Station

By Lloyd Jacquet

AS I sit at my faithful radio receiving set at this moment, listening to the whisperings of a continent, a twist of the dial brings to me the delightful concert from a favorite station. I have listened several minutes to a flute solo, and as the selection ends, I find myself applauding. I have enjoyed the music thoroughly.

It occurs to me suddenly, as I await the next number on the program, that I have known that station a long time. It is like an old friend, which beckons to me, and which responds willingly to my nightly call. It is a living thing, with a voice, and a personality. It has a name, it sings, it talks, it plays. It has a very definite entity, and characteristics which permits one to identify it instantly from among hundreds of others.

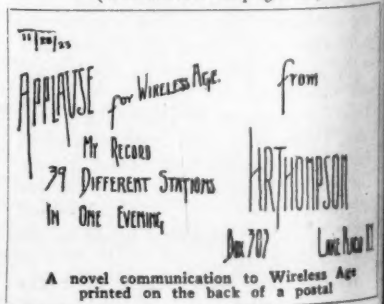
Then, I feel as though this station had grown very dear to me. Every evening, I "tune it in," certain to find some kind of entertainment which will provide me with an evening's recreation. It is just what I need after a hard day's work. And in a peculiar uncanny way, the station seems to guess the sort of program which I would like to have, and it fits my peculiar moods and feelings that evening. What a wonderful and sympathetic pal it has grown to be!

Of course, there are many other stations to which I like to listen. Some evening, I miss one of the many voices, those voices from the ether, more ghostly than the most realistic of spirits. Another station has been discontinued. Another voice has been stilled. It seems that, as with a living thing, something has died. I have heard stations pass out of the brilliant ether firmament, quietly, mysteriously, almost noiselessly. Whither have they gone?

And I have been wondering what this quality or sentiment can be, that something which attaches us to these voices, which are, after all nothing more than a mass of wire, batteries, and coils. What impels us, night after night, to turn the dial of the receiving apparatus to the same point, and to listen attentively for whatever station our desire has chosen for entertainment that evening? What makes us turn to that favorite station, when we have listened to dozens of others, East and West, and North and South? It is indeed a difficult thing to determine. But it must be something very akin to the instinct which prompts us to seek a particular friend from among many in a desire to share our joy, or to impart a secret.

I have been thinking also, as I turn the dial of my receiving set to further explore the wide expanse of the ether that I have not been treating this favorite station of mine right. I know that every human being likes to be encouraged, and wants to be told when something has caused much pleasure. I have been listening to this station for

(*Continued on page* 68)



A novel communication to Wireless Age printed on the back of a postal

BROADCASTING STATION DIRECTORY

(Revised to December 15th, 1923)

KAG	Young Men's Christian Association, Denver, Colo.	360
KFI	E. C. Antsony.....Los Angeles, Calif.	469
KFZ	Doerr Mitchell Electric Co.....Spokane, Wash.	283
KGB	Tacoma Daily Ledger.....Tacoma, Wash.	252
KGG	Hallock & Watson Radio Service, Portland, Ore.	360
KGH	Northwestern Radio Mfg. Co.....Portland, Ore.	360
KGU	M. A. Mulrony.....Honolulu, Hawaii	360
KGW	Oregonian Pub. Co.....Portland, Ore.	492
KGY	St. Martins College.....Lacey, Wash.	258
KHJ	Times Mirror Co.....Los Angeles, Calif.	395
KHQ	Louis Wasmer.....Seattle, Wash.	360
KJC	C. O. Gould.....Stockton, Calif.	360
KJR	Northwest Radio Service Co.....Seattle, Wash.	270
KJS	Bible Institute of Los Angeles, Inc., Los Angeles, Calif.	360
KLN	Monterey Electric Shop.....Monterey, Calif.	261
KLS	Warner Brothers.....Oakland, Calif.	360
KLX	Tribune Publishing Co.....Oakland, Calif.	360
KLZ	Reynolds Radio Co.....Denver, Colo.	360
KMC	Lindsay-Weatherill & Co.....Reedley, Calif.	360
KMJ	San Joaquin Light & Power Corp., Fresno, Calif.	360
KMO	Love Electric Co.....Tacoma, Wash.	360
KNT	Grays Harbor Radio Co.....Aberdeen, Wash.	263
KNV	Radio Supply Co.....Los Angeles, Calif.	256
KNX	Electric Lighting Supply Co., Los Angeles, Calif.	360
KOB	New Mexico College of Agriculture and Mechanical Arts, State College, N. Mex.	360
KOP	Detroit Police Dept.....Detroit, Mich.	286
KQI	Modesto Evening News.....Modesto, Calif.	360
KPO	Hale Bros.....San Francisco, Calif.	423
KQI	University of California.....Berkeley, Calif.	360
KQP	Asple City Radio Club.....Hood River, Ore.	360
KQV	Doubleday-Hill Electric Co.....Pittsburgh, Pa.	360
KQW	Charles D. Herreld.....San Jose, Calif.	360
KRE	Berkeley Daily Gazette.....Berkeley, Calif.	278
KSD	Post-Dispatch.....St. Louis, Mo.	546
KSS	Prest & Dean Radio Rsch. Lab., Long Beach, Calif.	360
KTW	First Presbyterian Church.....Seattle, Wash.	360
KUO	The Examiner Printing Co., San Francisco, Calif.	360
KUS	City Dye Works & Laundry Co., Los Angeles, Calif.	360
KUY	Coast Radio Co.....El Monte, Calif.	256
KWG	Portable Wireless Telephone Co., Stockton, Calif.	360
KWH	Los Angeles Examiner.....Los Angeles, Calif.	360
KXD	Herald Publishing Co.....Modesto, Calif.	252
KYG	Electric Shop.....Honolulu, T. H.	360
KYW	Westinghouse Elec. & Mfg. Co....Chicago, Ill.	536
KZM	Preston, D. Allen.....Oakland, Calif	360
KZN	The Desert News.....Salt Lake City, Utah	360
KZV	Wenatchee Battery & Motor Co., Wenatchee, Wash.	360
KDKA	Westinghouse Elec. & Mfg. Co., Pittsburgh, Pa.	326
KDPM	Westinghouse Elec. & Mfg. Co., Cleveland, Ohio.	270
KDPT	Southern Electric Co.....San Diego, Calif.	244
KDLY	Telegram Publishing Co...Salt Lake City, Utah	360
KDYM	Savoy Theatre.....San Diego, Calif.	252
KDYL	Oregon Institute of Technology...Portland, Ore.	360
KDYS	The Tribune, Inc.....Great Falls, Mont.	360
KDYW	Smith, Hughes & Co.....Phoenix, Ariz.	360
KDYX	Star Bulletin Publishing Co...Honolulu, T. H.	360
KDZB	Frank E. Siefert.....Bakersfield, Calif.	240
KDZE	Rhodes Company.....Seattle, Wash.	455
KDZF	Automobile Club of So. Calif., Los Angeles, Calif.	278
KDZI	Electric Supply Co.....Wenatchee, Wash.	360
KDZK	Nevada Machinery & Electric Co....Reno, Nev.	360
KDZL	Pyle & Nichols.....Denver, Colo.	360
KDZR	Bellingham Publishing Co...Bellingham, Wash.	261
KDZT	Seattle Radio Association.....Seattle, Wash.	360
KDZU	Western Radio Corporation.....Denver, Colo.	360
KDZV	Cope & Cornwell Co.....Salt Lake City, Utah	360
KFAD	McArthur Brothers Mercantile Co., Phoenix, Ariz.	360
KFAE	State College of Washington.....Pullman, Wash.	360
KFAF	Western Radio Corporation.....Denver, Colo.	360
KFAI	University of Colorado.....Boulder, Colo.	360
KFAM	Electric Shop.....Moscow, Idaho	360
KFAN	Standard Publishing Co.....Butte, Mont.	360
KFAR	Studio Lighting Service Co....Hollywood, Calif.	280
KFAT	Dr. J. T. Donohue.....Eugene, Ore.	275
KFAU	Independent School District of Boise City	
KFAV	Abbot Kinney Company.....Venice, Calif.	258
KFAY	W. J. Virgin.....Medford, Ore.	283
KFAW	The Radio Den, Ashford & White, Santa Anna, Calif.	280
KFBB	F. A. Buttrey & Co.....Havre, Mont.	360
KFBC	W. E. Ashill.....San Diego, Calif.	360
KFBE	Reuben H. Horn.....San Luis Obispo, Calif.	360
KFBK	Kimball-Upson Co.....Sacramento, Calif.	283
KFBL	Leese Bros.....Everett, Wash.	224
KFBS	Chronicle News and Gas & Elec. Supply Co., Trinidad, Colo.	360
KFBU	Bishop N. S. Thomas.....Laramie, Wyo.	283
KFCB	Salem Elec. Co.....Salem, Ore.	360
KFCF	Frank A. Moore.....Walla Walla, Wash.	360
KFCH	Electric Service Station.....Billings, Mont.	360
KFCK	Colorado Springs Radio Co., Colorado Springs, Colo.	242
KFCM	Richmond Radio Shop.....Richmond, Calif.	360
KFCP	Ralph W. Flygare.....Ogden, Utah	360
KFCQ	Motor Service Station.....Casper, Wyo.	360
KFCV	Fred Maadfey, Jr.....Houston, Tex.	360
KFCY	Western Union College.....LeMars, Iowa	252
KFCZ	Omaha Central High School.....Omaha, Nebr.	258
KFDA	Adler's Music Store.....Baker, Ore.	360
KFDB	Mercentile Trust Co.....San Francisco, Calif.	509
KFDF	St. Michaels Cathedral.....Boise, Idaho	360
KFDH	Wyoming Radio Corp.....Casper, Wyo.	360
KFDJ	University of Arizona.....Tucson, Ariz.	360
KFDL	Oregon Agri. College.....Corvallis, Ore.	360
KFDM	Knight-Campbell Music Co.....Denver, Colo.	360
KFDN	H. E. Cutting.....Bozeman, Mont.	248
KFDU	Bulleck's Hardware & Sporting Goods, York, Nebr.	360
KFDV	Nebraska Radio and Electric Co., Lincoln, Nebr.	240
KFDX	Gilbreth & Stinson.....Fayetteville, Ark.	360
KFDY	First Baptist Church.....Shreveport, La.	360
KFDZ	South Dakota State College of Agri. & Mech. Arts, Brooklings, S. D.	360
KFEC	Harry O. Iverson.....Minneapolis, Minn.	231
	Meier & Frank Co.....Portland, Ore.	360
KFEJ	Guy Greason.....Tacoma, Wash.	360
KFEL	Winner Radio Corporation.....Denver, Colo.	360
KFEP	Radio Equipment Co.....Denver, Colo.	240
KFEQ	J. L. Scroggin.....Oak, Nebr.	360
KFER	Auto Electric Service Co.....Ft. Dodge, Iowa	231
KFEV	Radio Electric Shop.....Douglas, Wyo.	360
KFEX	Augsburg Seminary.....Minneapolis, Minn.	261
KFEY	Bunker Hill & Sullivan Mining & Const. Co., Kellogg, Idaho	360
KFEZ	American Society of Mech. Engrs., St. Louis, Mo.	360
KFFE	Eastern Oregon Radio Co.....Pendleton, Ore.	360
KFFF	Jenkins Furniture Co.....Boise, Idaho	360
KFFG	Dr. E. H. Smith.....Hilisboro, Ore.	220
KFFQ	Markschoffel Motor Co....Colorado Springs, Colo.	360
KFFR	Jim Kirk.....Sparks, Nev.	226
KFFV	Garceland College.....Lamoni, Iowa	360
KFFX	McGraw Co.....Omaha, Nebr.	278
KFFY	Pincus & Murphy, Inc.....Alexandria, La.	275
KFFZ	Al. G. Barnes Amusement Co.....Dallas, Tex.	226
KFGC	Louisiana State University....Baton Rouge, La.	254
KFGD	Oklahasha Radio & Elec. Co..Chickasha, Okla.	248
KFGF	Buchanan Stevens & Co....Mt. Vernon, Wash.	360
KFGH	Leland Stanford, Jr., Univ..Stanford Univ., Colo.	360
KFGJ	National Guards Co., 138th Inf., St. Louis, Mo.	266
KFGL	Arlington Garage.....Arlington, Ore.	234
KFGQ	Crary Hardware Co.....Boone, Iowa	226
KFGV	Heidbreder Radio Supply Co.....Utica, Nebr.	224
KFGX	First Presbyterian Church.....Orange, Tex.	250
KFGZ	Emmanuel Missionary Co., Berrien Springs., Mich.	268
KFHA	Western State College of Colorado, Gunnison, Colo.	252
KFHB	The Rialto Theatre.....Hood River, Ore.	360
KFHD	Utz Electric Co.....St. Joseph, Mo.	226
KFHF	Central Christian Church.....Shreveport, La.	206
KFHH	Andrew A. McCue.....Neah Bay, Wash.	283
KFHJ	Fallon Co.....Santa Barbara, Calif.	360
KFHQ	Curtis Brothers Hardware Store, Los Gatos, Calif.	242
KFHR	Star Elec. and Radio Co.....Seattle, Wash.	270
KFHS	Robert Washington Nelson...Hutchinson, Kans.	229
KFIB	Frankiin W. Jenkens.....St. Louis, Mo.	244
KFIC	Philip Laskowitz Garage.....Denver, Colo.	234
KFID	Ross Arbuckles Garage.....Iola, Kans.	240
KFIF	Benson Tech. Student Body.....Portland, Ore.	360
KFIK	Gladbrook Electric Co.....Gladbrook, Iowa	234
KFIL	Windisch Elec. Farm Equipment Co., Louisburg, Kans.	234
KFIO	North Central High School.....Spokane, Wash.	252
KFIQ	Yakima Valley Radio Broadcasting Association, Yakima, Wash.	234
KFIU	Alaska Elec. Light & Power Co., Juneau, Alaska	226
KFIV	V. H. Broyles.....Pittsburg, Kans.	240
KFIX	Reorganized Church of Jesus Christ, Latter Day Saints, Independence, Kans.	240
KFIY	Brott Laboratories.....Seattle, Wash.	236
KFIZ	Daily Commonwealth.....Fond du Lac, Wisc.	273
KFJA	Central Public Co.....Grand Island, Nebr.	244
KFJB	Marshall Electric Co., Inc..Marshalltown, Iowa	254
KFJC	Post Intelligencer.....Seattle, Wash.	233
KFJD	Weld County Printing & Pub. Co., Greeley, Colo.	236
KFJF	National Radio Mfg. Co..Oklahoma City, Okla.	252
KFJH	The Sugar Bowl.....Selma, Calif.	273
KFJI	Liberty Theatre.....Astoria, Ore.	252
KFJJ	Carrollton Radio Shop.....Carrollton, Mo.	236
KFJM	University of North Dakota, Grand Forks, N. D.	229
KFJR	Ashley C. Dixon & Co....Stevensville, Mont.	258
KFJU	Central Power Co.....Kearney, Nebr.	234
KFJV	T. H. Warren.....Dexter, Iowa	224
KFJW	Le Grand Radio Co.....Towanda, Kans.	226
KFJX	Iowa State Teachers College...Cedar Falls, Iowa	229
KFJZ	Texas National Guard, 112th Cav., Fort Worth, Texas	254
KFKA	Colorado State Teachers College...Greeley, Colo.	246
KFKB	Brinkley-Jones Hospital Association, Milford, Kans.	286
KFKH	Denver Park Amusement Co.....Lakeside, Colo.	226
KFKJ	Conway Radio Laboratories.....Conway, Ark.	224
KFKV	P. P. Gist.....Butte, Mont.	283
KFKX	Westinghouse Electric Co.....Hastings, Nebr.	545
KFKZ	Nasour Bros. Radio Co...Colorado Springs, Colo.	234
KFLA	Abner R. Wilson.....Butte, Mont.	283
KFLB	Signal Electric Mfg. Co.....Menominee, Mich.	248
KFLD	Paul E. Greenlaw.....Franklinton, La.	234
KFLE	National Educational Service.....Denver, Colo.	268
KFLH	Erickson Radio Co., Inc....Salt Lake City, Utah	261
KFLP	Everett M. Foster.....Cedar Rapids, Iowa	240
KFLQ	Bizzell Radio Shop.....Little Rock, Ark.	261
KFLR	University of New Mexico...Albuquerque, N. M.	254
KFLU	Rio Grande Radio Supply House, San Benito, Tex.	236
KFLV	Rev. A. T. Frykman.....Rockford, Ill.	229
KFLW	Missoula Electric Supply Co....Missoula, Mont.	360
KFLX	George R. Clough.....Galveston, Texas	240
KFLY	Fargo Radio Supply Co.....Fargo, N. D.	231
KFLZ	Atlantic Automobile Co.....Atlantic, Iowa	273
KFMQ	University of Arkansas.....Fayetteville, Ark.	263
WBL	T. & H. Radio Co.....Anthony, Kans.	286
WBS	May & Co.....Newark, N. J.	360
WBT	Southern Radio Corporation...Charlotte, N. C.	360
WBZ	Westinghouse Elec. & Mfg. Co...Springfield, Mass.	337
WCE	Findley Electric Co.....Minneapolis, Minn.	360
WCK	Stix-Baer-Fuller.....St. Louis, Mo.	545
WCM	University of Texas.....Austin, Texas	360
WCX	Detroit Free Press.....Detroit, Mich.	517
WDM	Church of the Covenant.....Washington, D. C.	360
WDT	Ship Owners Radio Service, Inc., Premier Grand Piano Corporation, New York, N. Y.	405
WDZ	James L. Bush.....Tuscola, Ill.	278
WEB	Benwood Co.....St. Louis, Mo.	545
WEV	Hurlburt-Still Electrical Co....Houston, Tex.	360
WEW	St. Louis University.....St. Louis, Mo.	261
WFI	Strawbridge & Clothier.....Philadelphia, Pa.	395
WFY	Cosradio Co.....Wichita, Kans.	360
WGI	American Radio and Research Corporation, Medford Hillside, Mass.	360
WGL	Thomas F. J. Howlett.....Philadelphia, Pa.	360
WGR	Federal Tel. & Tel. Co.....Buffalo, N. Y.	319
WGV	Interstate Electric Co.....New Orleans, La.	360
WGY	General Electric Co.....Schenectady, N. Y.	380
WHA	University of Wisconsin.....Madison, Wisc.	360
WHB	Sweeney School Co.....Kansas City, Mo.	411
WHK	The Radiovox Company.....Cleveland, Ohio	360
WHN	Loew's State Theatre....New York City, N. Y.	360
WHX	Iowa Radio Corporation.....Des Moines, Iowa	360
WIK	K. & L. Electric Co.....McKeesport, Pa.	234
WIL	Continental Electric Supply Co., Washington, D. C.	360
WIP	Gimbel Bros.....Philadelphia, Pa.	508
WIZ	Cino Radio Mfg. Co.....Cincinnati, Ohio	360
WJD	Richard Harris Howe.....Granville, Ohio	229
WJH	White & Boyer Co.....Washington, D. C.	273
WJK	Service Radio Equipment Co....Toledo, Ohio	360
WJX	DeForest Radio Tel. & Tel. Co., New York, N. Y.	360
WJY	Radio Corp. of America—Aeolian Hall, N. Y. C.	405
WJZ	Radio Corp. of America—Aeolian Hall, N. Y. C.	455
WKA	Landaus Music & Jewelry Co., Wilkes-Barre, Pa.	360
WKY	Oklahoma Radio Shop....Oklahoma City, Okla.	360
WLB	University of Minnesota.....Minneapolis, Minn.	360
WLH	Hamilton Mfg. Co.....Indiannapolis, Ind.	360
WLW	Crosley Manufacturing Co.....Cincinnati, Ohio	309
WMA	Arrow Radio Laboratories.....Anderson, Ind.	360
WMC	Commercial.....Memphis, Tenn.	500
WMH	Precision Equipment Co.....Cincinnati, Ohio	248
WMU	Doubleday-Hill Elec. Co.....Pittsburgh, Pa.	261
WNJ	Shotten Radio Mfg. Co.....Albany, N. Y.	400
WNO	Wireless Telephone Co. of Hudson County, Jersey City, N. J.	360
WOC	Palmer School of Chiropractic..Davenport, Iowa	484
WOI	Iowa State College.....Ames, Iowa	360
WOK	Arkansas Light & Power Co...Pine Biuff, Iowa	360
WOO	John Wanamaker.....Philadelphia, Pa.	509
WOQ	Western Radio Co...Kansas City, Mo.	360
WOR	L. Bamberger Co.....Newark, N. J.	405
WOS	Missouri State Marketing Bureau, Jefferson City, Mo.	441
WPA	Fort Worth Record.....Fort Worth, Tex.	360
WPG	Nushawg Poultry Farm....New Lebanon, Ohio	234
WPI	Electric Supply Co.....Clearfield, Pa.	360
WQX	Walter A. Kushl.....Chicago, Ill.	360
WRC	Radio Corporation of America..Washington, D. C.	469
WRK	Doron Brothers Electric Co....Hamilton, Ohio	244
WRL	Union College.....Schenectady, N. Y.	360
WRM	University of Illinois.....Urbana, Ill.	360
WRR	City of Dallas (Police and Fire Signal Department), Dallas, Tex.	360
WRW	Tarrytown Radio Research Lab., Tarrytown, N. Y.	273
WSB	Atlanta Journal.....Atlanta, Ga.	428
WSL	J. H. Miller Elec. Co.....Utica, N. Y.	273
WSY	Alabama Power Co.....Birmingham, Ala.	360
WSZ	Marshall-Gerken Co.....Toledo, Ohio	360
WTG	Kansas State Agr. College....Manhattan, Kans.	360
WTP	George M. McBride.....Bay City, Mich.	360
WWI	Ford Motor Co.....Dearborn, Mich.	273
WWJ	The Detroit News.....Detroit, Mich.	517
WWL	Loyola University.....New Orleans, La.	280
WAAB	Valdemar Jensen.....New Orleans, La.	268
WAAC	Tulane University.....New Orleans, La.	360
WAAD	Ohio Mechanics Institute.....Cincinnati, Ohio	360
WAAF	Chicago Daily Drovers Journal....Chicago, Ill.	268
WAAK	Gimbel Bros.....Milwaukee, Wisc.	280
WAAM	L. R. Nelson Co.....Newark, N. J.	263
WAAN	University of Missouri.....Columbia, Mo.	264
WAAQ	New England Motor Sales Co., Greenwich, Conn.	360
WAAS	Georgia Radio Co.....Decatur, Ga.	360
WAAW	Omaha Grain Exchange.....Omaha, Nebr.	360
WAAZ	Hollister-Miller Motor Co.....Emporia, Kans.	360
WABA	Lake Forest College.....Lake Forest, Ill.	266
WABB	Dr. John B. Lawrence.....Harrisburg, Pa.	266
WABC	Fulwider-Grimes Battery Co.....Anderson, Ind.	229
WABD	Parker High School.....Dayton, Ohio	252
WABE	Y. M. C. A.....Washington, D. C.	226
WABF	Mt. Vernon Register-News Co...Mt. Vernon, Ill.	283
WABG	Arnold Edwards Piano Co....Jacksonville, Fla.	234
WABH	Lake Shore Tire Co.....Sandusky, Ohio	248
WABI	Bangor Railway and Electric Co....Bangor, Me.	240
WABJ	Radio Laboratories.....South Bend, Ind.	240
WABK	First Baptist Church.....Worcester, Mass.	252
WABL	Connecticut Agri. College.....Storrs, Conn.	283
WABM	F. E. Doherty.....Saginaw, Mich.	254
WABN	Waldo C. Grover.....La Crosse, Wisc.	234
WABO	Lake Avenue Baptist Church....Rochester, N. Y.	252
WABP	Robert P. Weinhig.....Dover, Ohio	286
WABQ	Haverford College Radio Club...Haverford, Pa.	261
WABR	Scott High School.....Toledo, Ohio	270
WABS	Essex Mfg. Co.....Newark, N. J.	244
WABT	Holliday-Hall.....Washington, Pa.	252
WABU	Victor Talking Machine Co.....Camden, N. J.	226
WABV	John H. De Witt, Jr.....Nashville, Tenn.	263
WABX	Indian Pipe Line Corp.....Princeton, Ind.	360
WBAA	Purdue University.....West Lafayette, Ind.	360
WBAD	Sterling Electric Co. and Journal Printing Co., Minneapolis, Minn.	360
WBAH	The Dayton Co.....Minneapolis, Minn.	417
WBAN	Wireless Phone Corporation.....Paterson, N. J.	244
WBAO	James Millikin University.....Decatur, Ill.	360
WBAP	Wortham-Carter Pub. Co., The Star Telegram, Fort Worth, Tex.	476
WBAV	Erner & Hopkins Co.....Columbus, Ohio	390
WBAW	Marietta College.....Marietta, Ohio	246
WBAX	John H. Stenger, Jr.....Wilkes-Barre, Pa.	360
WBAY	Western Electric Co.....New York, N. Y.	492
WBBA	Newark Radio Laboratory.....Newark, Ohio	240
WBBD	Barbey Battery Service.....Reading, Pa.	224
WCAD	St. Lawrence University.....Canton, N. Y.	280
WCAE	Kaufman & Baer Co.....Pittsburgh, Pa.	462
WCAF	Michigan Limestone & Chemical Co., Rodgers, Mich.	360
WCAG	Clyde R. Randall.....New Orleans, La.	268
WCAH	Entrekin Electric Co.....Columbus, Ohio	286
WCAJ	Nebraska Wesleyan University, University Pl., Nebr.	360
WCAK	Alfred P. Daniel.....Houston, Tex.	360
WCAL	St. Olaf College.....Northfield, Minn.	360
WCAM	Villanova College.....Villanova, Pa.	360
WCAO	Sanders & Stayman Co.....Baltimore, Md.	360
WCAP	Chesapeake & Potomac Tel. Co., Washington, D. C.	469
WCAR	Alamo Radio Electric Co.....San Antonio, Tex.	360

WCAB Dunworthy Industrial Institute, Minneapolis, Minn. 246
WCAT South Dakota School of Mines..Rapid City, S. D. 240
WCAU Durham & Co. .....Philadelphia, Pa. 285
WCAV J. C. Dice Electric Co.....Little Rock, Ark. 360
WCAX University of Vermont.....Burlington, Vt. 360
WCAY Kesselman O'Driscoll Music House, Milwaukee, Wisc. 261
WCAZ Carthage College.....Carthage, Ill. 246
WCBA Charles W. Haimbach.....Allentown, Pa. 280
WCBD Zion Radio Broadcasting Station.....Zion, Ill. 345
WDAE Tampa Daily Times.....Tampa, Fla. 360
WDAF Kansas City Star.....Kansas City, Mo. 411
WDAG Martin J. Laurence.....Amarillo, Tex. 253
WDAH Trinity Methodist Church.....El Paso, Texas 268
WDAK Hartford Courant.....Hartford, Conn. 261
WDAL Florida Times Union.....Jacksonville, Fla. 360
WDAM Weston Electric Co.....New York, N. Y. 360
WDAO Automotive Electric Co.....Dallas, Tex. 360
WDAP The Board of Trade.....Chicago, Ill. 360
WDAR Lit Brothers .....Philadelphia, Pa. 395
WDAS Samuel W. Waite.....Worcester, Mass. 360
WDAU Slocum & Kilburn.....New Bedford, Mass. 360
WDAX First National Bank.....Centerville, Iowa 268
WDAY Fargo Radio Service Co.....Fargo, N. D. 244
WDBC Kirk Johnson & Co., Inc.....Lancaster, Pa. 258
WEAA Fallain & Lathrop.....Flint, Mich. 280
WEAE Virginia Polytechnic Institute..Blacksburg, Va. 360
WEAF American Tel. & Tel.....New York, N. Y. 492
WEAH Wichita Board of Trade.....Wichita, Kans. 244
WEAI Cornell University.....Ithaca, N. Y. 396
WEAJ University of South Dakota.....Vermillion, S. D. 283
WEAM North Plainfield, Borough of Plainfield, North Plainfield, N. J. 252
WEAN Shepard Co.....Providence, R. I. 273
WEAO Ohio State University.....Columbus, Ohio 360
WEAP Mobile Radio Co., Inc.....Mobile, Ala. 360
WEAR Baltimore Am. & News Pub. Co., Baltimore, Md. 360
WEAS Hecht Company.....Washington, D. C. 360
WEAU Davidson Brothers Co.....Sioux City, Iowa 360
WEAY Will Horwitz, Jr.....Houston, Tex. 360
WEAZ Donald Redmond.....Waterloo, Iowa 360
WFAA A. H. Belo & Co.....Dallas, Tex. 476
WFAB Carl C. Woese.....Syracuse, N. Y. 234
WFAF Henry C. Spratley.....Poughkeepsie, N. Y. 273
WFAG Radio Engineering Laboratory, Waterford, N. Y. 360
WFAH Electric Supply Co.....Fort Arthur, Tex. 236
WFAJ Hi-Grade Wireless Instrument Co., Asheville, N. C. 360
WFAM Times Publishing Co.....St. Cloud, Minn. 360
WFAN Hutchinson Elec. Service Co..Hutchinson, Minn. 360
WFAQ Missouri Wesleyan College & Cameron Radio Co., Cameron, Mo. 360
WFAT Daily Argus Leader.....Sioux Falls, S. D. 360
WFAV University of Nebraska.....Lincoln, Nebr. 275
WGAC Orpheum Radio Stores Co.....Brooklyn, N. Y. 360
WGAD Spanish Am. Sch. of Telegraphy, Enconada, P. R. 360
WGAJ W. H. Glass.....Shenandoah, Iowa 360
WGAL Lancaster Elec. Supply & Const. Co., Lancaster, Pa. 248
WGAN Cecil E. Lloyd.....Pensacola, Fla. 360
WGAQ W. G. Patterson.....Shreveport, La. 360
WGAW Ernest C. Albright.....Altoona, Pa. 261
WGAX Radio Electric Co., Washington Courthouse, Ohio 360
WGAY North Western Radio Co.....Madison, Wisc. 360
WGAZ South Bend Tribune.....South Bend, Ind. 360
WHAA State University of Iowa.....Iowa City, Iowa 283
WHAB Clark W. Thompson.....Galveston, Tex. 360
WHAC Cole Brothers Elec. Co.....Waterloo, Iowa 360
WHAD Marquette University.....Milwaukee, Wisc. 360
WHAG University of Cincinnati.....Cincinnati, Ohio 222
WHAH J. T. Griffin.....Joplin, Mo. 360
WHAK Roberts Hardware Co.....Clarksburg, West Va. 258
WHAM Eastman School of Music of Univ. of Rochester, Rochester, N. Y. 283
WHAP Dewey L. Otta.....Decatur, Ill. 360
WHAR Paramount Radio and Elec Co., Atlantic City, N. J. 231
WHAS Courier Journal & Times.....Louisville, Ky. 400
WHAV Wilmington Elec. & Supply Co., Wilmington, Del. 360
WHAX Huntington Press.....Huntington, Ind. 360
WHAZ Rensselaer Polytechnic Institute.....Troy, N. Y. 380
WIAB Joslyn Automobile Co.....Rochford, Ill. 360
WIAD Howard R. Miller .....Philadelphia, Pa. 254
WIAF Gustav A. De Cortin.....New Orleans, La. 234
WIAH Continental Radio and Mfg. Co., Inc., Newton, Iowa 258
WIAI Heers Stores Co.....Springfield, Mo. 252
WIAK Journal Stockman Co.....Omaha, Nebr. 278
WIAP J. A. Rudy & Sons.....Paducah, Ky. 360
WIAQ Chronicle Publishing Co.....Marion, Ind. 226
WIAS Burlington Hawkeye-Home Elec. Co., Burlington, Ia. 360
WIAT Leon T. Noel.....Tarkio, Mo. 360
WIAU American Sec. & Sav. Bank.....Le Mars, Ia. 360
WIAV New York Radio Laboratories, Binghamton, N. Y. 360
WIAW Saginaw Radio & Elec. Co.....Saginaw, Mich. 360
WJAD Jackson's Radio Eng. Lab.....Waco, Tex. 360
WJAF Press Pub. Co.....Muncie, Ind. 360
WJAG Huse Publishing Co.....Norfolk, Nebr. 360
WJAJ Y. M. C. A.....Dayton, Ohio 360
WJAK Rev. C. L. White.....Greentown, Ind. 254
WJAM B. C. Perham.....Cedar Rapids, Iowa 268
WJAN Peoria Star Co.....Peoria, Ill. 280
WJAR The Outlet Co.....Providence, R. I. 360
WJAS Capper Publications.....Topeka, Kans. 360
WJAT Kelly-Vawter Jewelry Co.....Marshall, Mo. 360
WJAX Union Trust Co.....Cleveland, Ohio 390
WJAZ Chicago Radio Laboratory.....Chicago, Ill. 448
WKAA H. F. Paar.....Cedar Rapids, Iowa 268
WKAD Charles Looff.....East Providence, R. I. 240
WKAF W. S. Radio Supply Co. and Wm. Schack, Wichita Falls, Tex. 360
WKAN Alabama Radio Mfg. Co.....Montgomery, Ala. 360
WKAP Dutee Wilcox Flint.....Cranston, R. I. 360
WKAQ Radio Corporation of Porto Rico, San Juan, P. R. 360
WKAR Michigan Agri. College...East Lansing, Mich. 280
WKAS L. E. Lines Music Co.....Springfield, Mo. 360
WKAV Laconia Radio Club.....Laconia, N. H. 254
WKAW United Battery Service Co., Montgomery, Ala. 226
WKAY Brenau College.....Gainesville, Ga. 280
WLAG Cutting & Washington Radio Corp., Minneapolis, Minn. 417
WLAH Samuel Woodworth.....Syracuse, N. Y. 234
WLAJ Waco Electrical Supply Co.....Waco, Tex. 360
WLAK Vermont Farm Mach. Co....Bellows Falls, Vt. 360
WLAL Tulsa Radio Co.....Tulsa, Okla. 360
WLAN Putnam Hardware Co.....Houlton, Me. 283
WLAP W. V. Jordon.....Louisville, Ky. 360
WLAQ Arthur S. Schilling .....Kalamazoo, Mich. 283
WOAR Henry P. Lundskow .....Kenosha, Wisc. 229
WLAS Central Radio Supply Co.....Hutchinson, Kans. 244
WLAT Radio and Specialty Co.....Burlington, Iowa 360
WLAV Electric Shop, Inc.....Pensacola, Fla. 254
WLAW New York Police Dept.....New York, N. Y. 360
WLAX Greencastle Community Broadcasting Station, Greencastle, Ind. 231
WMAB Radio Supply Co.....Oklahoma City, Okla. 360
WMAC J. Edward Page.....Cazenovia, N. Y. 261
WMAF Round Hills Radio Corp.....Dartmouth, Mass. 360
WMAH General Supply Co.....Lincoln, Nebr. 254
WMAJ Drovers Telegram Co.....Kansas City, Mo. 275
WMAK Norton Laboratories.....Lockport, N. Y. 360
WMAL Trenton Hdw. Co.....Trenton, N. J. 250
WMAN First Baptist Church.....Columbus, Ohio 286
WMAP Utility Battery Service, Inc.....Easton, Ohio 246
WMAQ Chicago Daily News .....Chicago, Ill. 448
WMAV Alabama Polytechnic Institute....Auburn, Ala. 250
WMAW Wahpeton Elec. Co.....Wahpeton, N. D. 360
WMAY Kingshighway Presby. Church....St. Louis, Mo. 280
WMAZ Mercer University .....Macon, Ga. 288
WNAB Park City Daily News.....Bowling Green, Ky. 360
WNAC Shepard Stores .....Boston, Mass. 278
WNAD Oklahoma Radio Eng. Co.....Norman, Okla. 360
WNAL R. J. Rockwell .....Omaha, Nebr. 242
WNAM Ideal Apparatus Co. .....Evansville, Ind. 360
WNAN Syracuse Radio Telephone Co..Syracuse, N. Y. 258
WNAP Wittenberg College .....Springfield, Ohio 360
WNAQ Charleston Radio Elec. Co....Charleston, S. C. 360
WNAR Rhodes, C. C. .....Butler, Mo. 231
WNAS Texas Radio Corporation and Austin Statesman, Austin, Tex. 360
WNAT Lenning Bros. Co. .....Philadelphia, Pa. 360
WNAV Peoples Tel. & Tel. Co.....Knoxville, Tenn. 236
WNAW Henry Kunzmann .....Fortress Monroe, Va. 360
WNAX Dakota Radio Apparatus Co.....Yankton, S. D. 244
WNAY Ship Owners' Radio Service.....Baltimore, Md. 360
WOAA Dr. Walter Hardy .....Ardmore, Okla. 360
WOAC Maus Radio Co. .....Lima, Ohio 286
WOAD Friday Battery & Elec. Co.....Sigourney, Iowa 360
WOAE Midland College .....Fremont, Nebr. 360
WOAF Tyler Commercial College.....Tyler, Tex. 360
WOAG Apollo Theatre .....Belvidere, Ill. 224
WOAH Palmetto Radio Corp.....Charleston, S. C. 360
WOAI Southern Equipment Co.....San Antonio, Texas 385
WOAJ Ervin's Electrical Co. .....Parsons, Kans. 360
WOAL Wm. Evans Woods .....Webster Groves, Mo. 286
WOAN James D. Vaughan .....Lawrenceburg, Tenn. 360
WOAP Kalamazoo College .....Kalamazoo, Mich. 360
WOAT Boyd Martell Hamp .....Wilmington, Del. 360
WOAV Pennsylvania National Guard.....Erie, Pa. 242
WOAW Woodmen of the World.....Omaha, Nebr. 526
WOAX Franklyn J. Wolff .....Trenton, N. J. 240
WPAB Pennsylvania State College..State College, Pa.
WPAC Donaldson Radio Co. .....Okmulgee, Okla.
WPAD Wiebodt & Co. .....Chicago, Ill.
WPAG Central Radio Co., Inc.....Independence, Mo.
WPAH Wisconsin Dept. of Markets.....Waupaca, Wisc.
WPAJ Doolittle Radio Corporation...New Haven, Conn.
WPAK No. Dakota Agricultural College...Fargo, N. D.
WPAL Superior Radio & Telephone Co., Columbus, Ohio
WPAM Awerbach & Guetzel .....Topeka, Kans.
WPAP Theodore D. Phillips .....Winchester, Ky.
WPAQ General Sales & Eng. Co.....Frostburg, Md.
WPAR R. A. Ward .....Beloit, Kans.
WPAS J. & M. Electric Co.....Amsterdam, N. Y.
WPAT St. Patrick's Cathedral .....El Paso, Tex.
WPAU Concordia College .....Moorhead, Minn.
WPAY Bangor Radio Laboratory .....Bangor, Me.
WPAZ John R. Koch .....Charleston, West Va.
WQAA Horace A. Beale, Jr.....Parkersburg, W. Va.
WQAC E. B. Gish .....Amarillo, Tex.
WQAD Whitehall Electric Co. .....Waterbury, Conn.
WQAE Moore Radio News Station.....Springfield, Vt.
WQAF Sandusky Register .....Sandusky, Ohio
WQAH Brock Anderson Elec. Eng. Co., Lexington, Ky.
WQAK Appel-Higley Electric Co.....Dubuque, Iowa
WQAL Cole County Tel. & Tel. Co.....Mattoon, Ill.
WQAM Electrical Equipment Co. .....Miami, Fla.
WQAN Scranton Times .....Scranton, Pa.
WQAO Calvary Baptist Church.....New York, N. Y.
WQAQ West Texas Radio Co.....Abilene, Tex.
WQAS Prince Walter Co. .....Lowell, Mass.
WQAX Radio Equipment Corporation.....Richmond, Va.
WQAV Huntington and Guerry, Inc....Greenville, S. C.
WQAW Catholic University of America, Washington, D. C.
WQAX Radio Equipment Co. .....Peoria, Ill.
WRAA Rice Institute .....Houston, Tex.
WRAD Taylor Radio Shop .....Marion, Kans.
WRAF Radio Club, Inc. .....Laporte, Ind.
WRAH Stanley N. Reed .....Providence, R. I.
WRAL Northern States Power Co..St. Croix Falls, Wis.
WRAM Lombard College .....Galesburg, Ill.
WRAN Black-Hawk Electric Co.....Waterloo, Iowa
WRAO Radio Service Co. .....St. Louis, Mo.
WRAV Antioch College .....Yellow Springs, Ohio
WRAW Herace D. Good .....Reading, Pa.
WRAX Flexon's Garage .....Gloucester City, N. J.
WRAY Radio Sales Corporation.....Scranton, Pa.
WRAZ Rensselaer Polytechnic Institute....Troy, N. Y.
WSAA B. S. Sprague Elec. Co.....Marietta, Ohio
WSAB Southeast Mo. State College, Cape Girardeau, Mo.
WSAC Clemson Agri. College....Clemson College, S. C.
WSAD J. A. Foster Co. .....Providence, R. I.
WSAH A. G. Leonard, Jr. .....Chicago, Ill.
WSAI U. S. Playing Card Co.....Cincinnati, Ohio
WSAJ Grove City College .....Grove City, Pa.
WSAL Franklin Electrical Co.....Brookville, Ind.
WSAN Allentown Radio Club .....Allentown, Pa.
WSAP Seventh Day Adventist Church..New York, N. Y.
WSAR Doughty & Welch Elec. Co....Fall River, Mass.
WSAT Plainview Elec. Co. .....Plainview, Tex.
WSAW Curtice & McElwee .....Canandaigua, N. Y.
WSAX Chicago Radio Laboratory.....Chicago, Ill.
WSAY Irving Austin, Chamber of Commerce, Port Chester, N. Y.
WSAZ Chase Electric Shop .....Pomeroy, Ohio
WTAB Fall River Daily Herald.....Fall River, Mass.
WTAC Penn Traffic Co. .....Johnstown, Pa.
WTAD Robert E. Compton .....Carthage, Ill.
WTAG Kern Music Co. .....Providence, R. I.
WTAH Carmen Ferro .....Belvidere, Ill.
WTAJ The Radio Shop .....Portland, Me.
WTAL Toledo Radio and Electrical Co., Toledo, Ohio
WTAM Willard Storage Battery Co....Cleveland, Ohio
WTAN Ornduff Radio Shop .....Mattoon, Ill.
WTAP Cambridge Radio & Electric Co..Cambridge, Ill.
WTAQ S. H. Van Gorden & Son.....Osseio, Wisc.
WTAR Reliance Electric Co. .....Norfolk, Va.
WTAS Charles E. Erbstein.....Elgin, Ill.
WTAT Edison Elect. Ill. Co.....Boston, Mass.
WTAU Ruegy Battery & Elec. Co.....Tecumseh, Nebr.
WTAW Agricultural and Mech. College, College Station, Tex.
WTAX Williams Hardware Co.....Streator, Ill.
WTAY Iodar-Oak Leaves Broadcasting Station, Oak Park, Ill.
WTAZ Thomas J. McGuire .....Lambertville, N. J.
WWAB Swern Hoenig & Co.....Trenton, N. J.
WWAC Sanger Brothers .....Waco, Tex.
WWAD Wright & Wright, Inc.....Philadelphia, Pa.
WWAE Alamo Danee Hall .....Joliet, Ill.
WWAF Galvin Radio Supply Co.....Camden, N. J.
WWAH General Supply Co. .....Lincoln, Nebr.
WWAO Michigan College of Mines....Houghton, Mich.

Canadian Broadcasting Stations

CKY Manitoba Telephone System.....Winnipeg, Manitoba
CFAC Radio Corporation of Calgary, Ltd...Calgary, Alberta
CFCA Star Publishing and Printing Co., Toronto, Ontario
CFCB Marconi Wireless Telegraph of Canada, Ltd., Vancouver, B. C.
CFCD Canadian Westinghouse Co., Ltd., Winnipeg, Manitoba
CFCE Marconi Wireless Telegraph Co. of Canada, Halifax, Nova Scotia
CFCF Marconi Wireless Telegraph Co. of Canada, Ltd., Montreal, Quebec
CFCH Abitibi Power and Paper Co., Ltd., Iroquois Falls, Ontario
CFCI Motor Products Corporation.....Walkerville, Ontario
CFCN W. W. Grant Radio, Ltd.....Calgary, Alberta
CFCX The London Advertiser.....London, Ontario
CFPC International Radio Development Co., Fort Frances, Ontario
CFTC The Bell Telephone Co. of Canada....Toronto, Ontario
CFUC University of Montreal.....Montreal, Quebec
CFVC Roy Russell Brown.....Courtenay, British Columbia
CFYC Victor Wentworth Odlum.....Vancouver, B. C.
CFZC Canadian Westinghouse Co., Ltd....Montreal, Quebec
CHAC Radio Engineers, Ltd.....Halifax, Nova Scotia
CHBC The Albertan Publishing Co.....Calgary, Alberta
CHCA Radio Corporation of Vancouver, Ltd., Vancouver, B. C.
CHCB Marconi Wireless Telegraph Co. of Canada, Ltd., Toronto, Ontario
CHCC Canadian Westinghouse Co., Ltd., Edmonton, Alberta
CHCF Radio Corporation of Winnipeg, Ltd., Winnipeg, Manitoba
CHCQ The Western Radio Co., Ltd.....Calgary, Alberta
CHCS London Radio Shoppe .....London, Ontario
CHCX B. L. Silver .....Montreal, Quebec
CHCZ The Globe Printing Co. .....Toronto, Ontario
CHFC John Millen & Sons, Ltd.....Toronto, Ontario
CHIC Canadian Westinghouse Co., Ltd....Hamilton, Ontario
CHOC Canadian Westinghouse Co., Ltd....Vancouver, B. C.
CHVC Metropolitan Motors, Ltd.....Toronto, Ontario
CHXC J. R. Booth, Jr. .....Ottawa, Quebec
CHYC Northern Electric Co. .....Montreal, Quebec
CJBC Dupuis Freres .....Montreal, Quebec
CJCA The Edmonton Journal, Ltd.....Edmonton, Alberta
CJCB James Gordon Bennett.....Nelson, British Columbia
CJCD T. Eaton Co., Ltd.....Toronto, Ontario
CJCE Vancouver Sun Radiotelephones, Ltd., Vancouver, B. C.
CJCF News Record, Ltd. .....Kitchener, Ontario
CJCG Manitoba Free Press Co., Ltd....Winnipeg, Manitoba
CJCH The United Farmers of Ontario.....Toronto, Ontario
CJCI McLean, Holt & Co., Ltd....St. John, New Brunswick
CJCN Simons Agnew & Co. .....Toronto, Ontario
CJCS Eastern Telephone and Telegraph Co., Ltd., Halifax, Nova Scotia
CJCY Edmund Taylor .....Calgary, Alberta
CJGC London Free Press Printing Co., Ltd., London, Ontario
CJNC Tribune Newspaper Co., Ltd.....Winnipeg, Manitoba
CJSC The Evening Telegram .....Toronto, Ontario
CKAC La Presse Publishing Co. .....Montreal, Quebec
CKCB T. Eaton Co., Ltd. .....Winnipeg, Manitoba
CKCD Vancouver Daily Provinces.....Vancouver, B. C.
CKCE Canadian Independent Telephone Co., Ltd., Toronto, Ontario
CKCK Leader Publishing Co., Ltd., of Regina, Regina, Saskatchewan
CKCR Jones Electric Radio Co.....St. John, New Brunswick
CKCS The Bell Telephone Co. of Canada...Montreal, Quebec
CKCZ Canadian Westinghouse Co., Ltd.....Toronto, Ontario
CKKC Radio Equipment and Supply Co.....Toronto, Ontario
CKOC The Wentworth Radio Supply Co.....Hamilton, Ontario
CKQC Radio Supply Co. of London.....London, Ontario
CKZC Salton Radio Engineering Co.....Winnipeg, Manitoba

Afloat and Ashore With the Operator

As Reported by W. S. Fitzpatrick

THE radio section of the New York Police Department has received many well deserved press notices of its activities and attained results, but it appears that commercial radio operators as a whole, much less the general public, are not as well informed as they should be regarding the service rendered and the achievement of KUVS and its subsidiary stations on the police boats about the harbor.

The section was organized in 1917 by Sergeant Charles E. Pearce and a short time later was placed under Inspector M. R. Brennan, Superintendent of Telegraph of the Police Department. With Sergeant Pearce as the practical radio head and as Inspector Brennan's chief adviser, the organization was developed into a high state of efficiency. Two years ago Sergeant Pearce retired from the Police Department to enter the service of the Radio Corporation of America, in which he is now an executive.

There is an efficient corps of operators, all with first class government licenses and all members of the Police Department, who alternate duty between the headquarters station and the police boats. These boats frequently go out into the open sea, so the men might well be termed seagoing operators.

Sergeant Charles E. Pearce, who built and operated the first successful Police Radio Station in the world

HEY! AL BRING THE CAMERA
HOW DO THEY GET LIKE THAT?
HE OUGHT TO HAVE HIS CALL LETTERS "CQ" AND "QRU" IN GOLD ON HIS COLLAR
PITY HE CAN'T CARRY THE SET AROUND AND SHOW IT TO THE GIRLS
ISN'T HE GRAND?
STENO
INDOOR RADIO SPORTS - RAZZING THE GUY WHO WEARS HIS UNIFORM ASHORE

In addition to the assistant operators, the repair and apparatus men, the personnel of New York's police radio experts consists of John F. Ward, Charles E. Gaul, Charles E. Francis, Russell McKee, George Wolfe and Louis J. Michaels. During several years before joining the Police Department, Mr. Michaels was an operator on passenger ships and is well known among commercial radio men.

Quite a number of communications pass between big passenger liners and the headquarters station and boats and there have been occasions when cargo ships were well served by the alertness of the police operators.

* * *

An example of the opportunity for travel afforded radio men can be cited by Paul S. Barnard, who lives in San Francisco and who was running on ships out of that port. He wanted to see England. When he told the chief operator at San Francisco of his desires that very accommodating gentleman, having no ships running direct to England to place him on, gave him an assignment to the Isthmian liner *Steelage*, bound for New York, then passed the word by mail to the chief operator at New York, requesting that Barnard's wish be respected, if possible. Upon the operator's arrival in New York, he was without loss of time transferred to the *Eastern Tempest*, on which he was enabled to spend a pleasant fortnight in England. Returning to New York he was transferred to the *Sutermco*, which brought him back to San Francisco, ending a quick, pleasant and profitable journey and fulfilling his wish.

* * *

A well known radio operator told this as an original story the other day. An old lady making her first sea voyage noticed the radio operators lounging easily and having a general pleasant time, while the captain and chief mate were forever hurrying about the ship, looking at this and that and always busy. Evidently she had made a comparison between the two lines of endeavor and when the opportunity afforded hailed the captain and inquired very sweetly:

"Oh, captain, how long do you have to serve in your present position before you become a radio operator?"

* * *

A comparison is often made between the present day marine radio working with that of a few years ago before the vacuum tubes came into use. The radio fan of today imagines that long distance receiving was unheard of and that broadcasting is not more than three years old.

Mr. C. D. Guthrie, now radio supervisor of the New York district office of the Shipping Board, used to listen to music being broadcast from a naval ship during the Jamestown Exposition in 1907. The writer heard an opera broadcast in 1910. Ships running to South America used to maintain direct communication with New York up to two and three thousand miles around 1909. San Francisco, with a five kilowatt transmitter and crystal detector, exchanged weather reports and names with Japan, a distance of 5,800 miles, in 1910.

Charles A. Hahne, now traffic manager of a radio company, was instrumental in saving the life of William Jennings Bryan and other passengers on a ship over two thousand miles away from New York, where he was a coast station operator, in 1911.

RADIO NEWS FROM ALL OVER THE WORLD

Government's Preparation for Mexico City Conference

WORK on the agenda of the United States for the forthcoming Inter-American Electrical Communications Commission, scheduled for January or February in Mexico City, is progressing rapidly. The Inter-Departmental Committee on Electrical Communications under the direction of Leland Harrison, Assistant Secretary of State, has organized a special sub-committee which is attacking the practical and operating problems having to do with international radio communications.

Judge S. B. Davis, Solicitor of the Department of Commerce, and representative of that department on the Communication Committee, has been designated as head of the radio sub-committee and has appointed two sections, one on technical problems and another on mobile radio questions.

Dr. J. H. Dellinger, of the Bureau of Standards, is chairman of the section on technical radio problems. This section is considering such problems as frequency, or wave length, allocation, means of preventing radio interference, and standards of technical operation, as well as the gathering of technical data relative to radio transmitting stations.

The section studying questions affecting mobile radio operation is headed by Commander D. C. Bingham, Asst. Director of Naval Communications. Questions affecting international rules regarding the operation of radio on board ships, aircraft, etc., will be studied by this committee. Among the subjects to be covered are: distress calls and matters pertaining to safety of life at sea, time signals, hydrographic and meteorological information of international interest.

Advice and suggestions from representatives of commercial companies will be sought on the matters under consideration, including standardization of practice and operation, in which agreements with other American Republics are desired.

Upon the completion of the two surveys by the United States Government Radio Committee, a comprehensive report to the full communication committee will be made, and in event of approval, it will form the basis of the "U. S." agenda to be carried to the Pan-American conference early in 1924 in Mexico. Later on, the agreements arrived at there may be presented to the World Conference on Electrical Communications in Paris, by accredited representatives of the New World.

Los Angeles to Hold Show

THE Second Annual Western Radio and Electrical Exposition will be held at the Biltmore Hotel from February 5 to 10. J. C. Johnson, of New York radio fame, will manage the show.

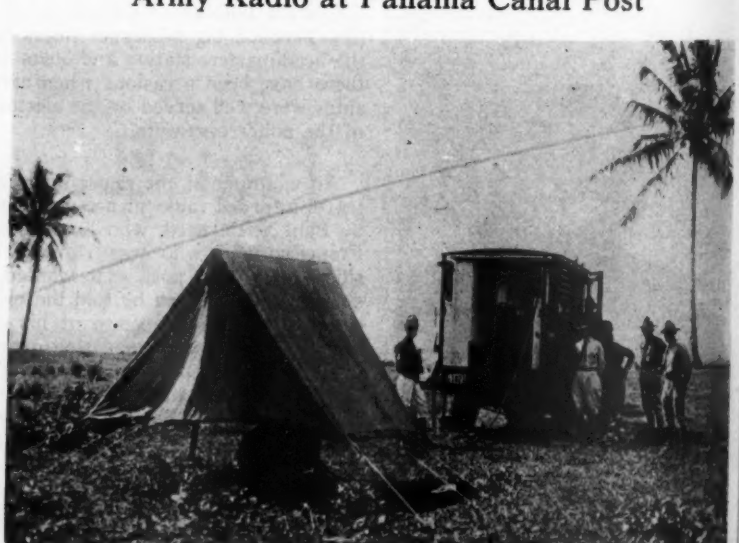
Progress of Radio on the Farm

AGENTS of the Department of Agriculture have estimated after a careful survey that there is a total of more than 145,000 radio sets on farms throughout the country. In New York it is estimated that there are 5,502 sets on farms. Two thousand five hundred sets are reported from the farms of Saratoga County alone. There are about 3,085 sets on Texas farms. Farms in other states are reported as follows: In Illinois, 2,814; in Ohio, 2,620; in Missouri, 2,861; in Iowa, 2,463, and in Kansas, 2,054. New Jersey, Pennsylvania, Michigan and Minnesota have between 1,000 and 2,000 sets each.

Owen D. Young for Reparation Commission

THE selection of Owen D. Young, Chairman of the Board of Directors of the Radio Corporation of America to be one of the two American experts serving on the committee which will investigate Germany's ability to pay is one that illustrates President Coolidge's shrewd evaluation of men and one that wins the hearty commendation of business men and men of affairs to whom Mr. Young's outstanding qualifications and accomplishments are well known.

Army Radio at Panama Canal Post



A detachment of the 10th Signal Company with radio tractor on the beach of Belle Vista, Republic of Panama

International Development of Radio Week

NATIONAL RADIO WEEK, November 25th to December 1st, was a week of memorable events.

In order to live up to the splendid co-operation from the press of the country to make that event the biggest, recent celebration on the air, programs were arranged to present the breadth of possibilities in home radio entertainment and to promote the social spirit that is possible by means of this universal as well as informal mode of communication.

Among the notable achievements of the week was the trans-oceanic broadcast station tests, organized and conducted by Radio Broadcast, the British Broadcasting Company and the Wireless World and Radio Review (London).

Of the most prominent speakers in this country were Owen D. Young, Chairman of the Boards of Directors of the General Electric Company and the Radio Corporation of America, General James G. Harbord, President of the Radio Corporation, Henry Ford and Charles Evans Hughes.

Co-operation of amateurs, ship and shore operators, broadcasters and radio executives undoubtedly made the tests a success. Because of the difference in time between England and America extreme care was necessary to assure "open air" and as well a convenient period when darkness prevailed simultaneously in both countries.

The British stations were received as far north as Nova Scotia, as far south as Texas and as far west as Davenport, Iowa, and scattered points in North Dakota. Altogether, 18 states in this country and two provinces in Canada are represented in the reports of successful reception.

In England the reception of American broadcast stations was generally more successful than the British stations heard on this side because our stations used more power for transmitting.

General James G. Harbord's address, an incident of National Radio Week and the concluding speech of the international broadcast tests, contained America's message to the British broadcast listeners.

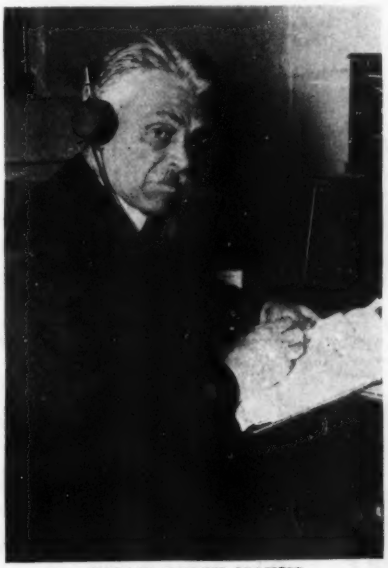
General Harbord opened his address with a comment on the marvel of talking to people of the Old and New Worlds without having to raise his voice above conversational tones.

Continuing, he said, "Leaders of political thought, culture, science and the arts are enabled to address millions of their countrymen in all walks of life, in city and country, with an ease rivaling the intimacy of the telephone.

"From those across the sea — our kinsmen by blood and tongue—have come your own statesmen in recent months, and served by this same genii, Radio, their voices have reached millions of our people.

"And now, scarcely before we have been able to grasp and assimilate the tremendous import of it all, we are invited to speak to our British cousins across the weary stretches of three thousand miles of the intervening Atlantic.

". . . As my voice reaches the people of England tonight, my memory pictures the great service and unfailing hospitality that our American soldiers



HIRAM PERCY MAXIM
President of the American Radio Relay League, caught England's "Hello, America"

received at your hands, while on their way to France . . .

"Our nations are closely cemented by the unity of a democratic purpose, by the same high ideals and by a common language. Let us hope that this first change of thought by voice across the broad Atlantic will serve to strengthen our existing friendship in permanent bonds of understanding.

"The programs of this National Radio Week have constituted the first attempt to reach you through organized broadcasting, and to receive your acknowledgments through your own broadcasting stations. Surely radio is the harbinger of a closer tie and more thorough understanding among the nations of the earth."

International broadcasting is now no longer an idle dream, but a fact.

MacMillan Arctic Expedition

THROUGH the station of Jack Barnsley, amateur operator, at Prince Rupert, B. C., messages have been received from the *Bowdoin*, icebound for the long Arctic winter, which inform that this adventurous party are keeping in the best of spirits very largely through the agency of radio. They report that they are hearing stations in England, Germany, Holland, Mexico, France, Norway, Italy, Japan and Spain, that they are getting each evening the news of the world from stations in Oxford, England and Nauen, Germany, and that the operator on the MacMillan ship has actually talked with 6CEU in Hawaii, over a distance of 5,000 miles.

Germans Radio to Moving Trains

GERMANY recently had a demonstration of wireless telephonic communication between a moving train and ordinary receiving and transmitting stations, according to U. S. Consul Richardson, at Berlin. Messages were exchanged between the President and officials of the government in Berlin and other officials on a train, moving at 30 miles an hour, half way between Berlin and Hamburg. The "Huth" system, which is a combination of wireless and wire transmission, was used. The sending apparatus was installed in a compartment on the train and the antenna rigged over the tops of two cars. The line telegraph wires along the track are said to have picked up the messages and transmitted them to Berlin, where the line was connected with a receiving set.

Radio Traffic Illustrated

DURING the course of his interesting address at the Boston City Club recently, dealing with the application of radio communication to ships at sea, Mr. David Sarnoff gave a practical demonstration of how effective radio has become in signaling to distant vessels.

For this experiment, the telegraphic controls of the high power marine radio station at Chatham, Mass., were linked by land wires to telegraph instruments on the speaker's platform. Thus Mr. Sarnoff was able by the operation of the instruments before him to reach out to the extremities of the North Atlantic and communicate with all vessels within radio range of the Chatham Station.

Mr. Sarnoff stepped to the sending key on the table before him and by the mere tapping of the key, he literally swept the ocean with radio waves laden with this message:

"Two thousand members and guests of Boston City Club now assembled in Boston intensely interested in special marine radio demonstratiton and would greatly appreciate courtesy of your advising quickly approximate distance from Boston and present weather conditions, thanks,

DAVID SARNOFF,
Vice-President and General Manager, Radio Corp. of America."

Replies to the message were received from vessels almost instantly and as replies were received the position of these vessels on the high seas was indicated on a chart of the world which had been provided on the platform, with the radio station at Chatham plainly indicated.

Radio in French Trains

SOME time ago experiments with radio on moving trains gave little hope of ultimate success, but only recently new attempts have shown the entire feasibility of the idea. After long and patient research new trials were conducted recently on the Bordeaux to Paris train, while it was between Tours and Paris, with encouraging results. The travelers were able to hear with ease and clarity both the concerts from the Radiola station and the news announcements of the Eiffel Tower.

The receiving set used four stages of radio frequency and one of audio, and was contained in a cabinet provided with rubber shock absorbers. Four loud speakers were used, two in each end of the car.

The antenna problem was solved by the use of three wires, each 20 meters (66 feet) long stretched inside the car. This meant that the antenna necessarily was low, but the line of the railroad is generally high and seemed to compensate for the lowness of the antenna. The ground consisted of an insulated wire stretched under the wooden steps that run the entire length of the car. In earlier tests an attempt was made to ground the receiver directly on the trucks of the car, but in the latest test this was not tried, the wire just described giving complete satisfaction.

Cuban Broadcasting Stations

CUBA boasts of twenty-seven radiophone broadcasting stations, of which six are rated at 500 watts. Four other stations have an output of 100 watts. The principal stations are PWX, the Cuban Telephone Company; 6KW, Frank H. Jones; 2CX, Frederick W. Borton, and 6DW, Eduardo Terry.

Radio Autos Touring France

THE magazine "Je Sais Tout" (I Know Everything) of Paris has started a radio-equipped automobile caravan on a tour of France. The expedition consists of three automobiles, under the direction of the engineer Guineau of the Ministry of Public Instruction, two of which carry a complete transmitter while the third is equipped with receiving apparatus. At each town at which a stop is made, the transmitter broadcasts a concert of speeches and music, which is reproduced through the loud speakers of the receiving automobile, which also on occasion picks up concerts from Paris.

Each automobile from the exterior seems like any ordinary limousine, but

Map showing route of radio autos

its equipment is anything but ordinary. The transmitter has 250 watts power, and works on 400 meters. An itinerary covering 8,000 kilometers (4,800 miles) in three and a half months has been laid out, taking the expedition not only throughout France, but also touching Belgium, Luxembourg, Switzerland and Spain.

This is the first effort of the kind in Europe, and is expected to add greatly to the popularity of the radio telephone in France and neighboring countries. Collections taken up at each stop will be added to those realized during the celebration at the Trocadero, Paris, several months ago, for the establishment of a foundation for rewarding inventors of important radio improvements.

An Uncanny Coincidence

By J. O. SMITH

RADIO is credited with many strange and weird performances and many are the tales that have been told of strange happenings in radio operation that could not be readily accounted for, but it is doubtful if anything more strange, in fact uncanny, has ever occurred than was true during the time all radio traffic and seacoast broadcasting was stopped on the night of November 29th because of an SOS from the SS. *Henry Farnum*, Call KQA, ashore off the Florida coast.

The *Farnum* first broadcasted an SOS about 9:00 P. M. which was first picked up by two other steamships, the KDCB and the WAX. These ships immediately rebroadcasted the SOS of the *Farnum* and the navy yard stations along the coast immediately ordered complete cessation of all ship-shore traffic. Broadcasting stations along the coast were also ordered to stop transmission.

Through this blanket of practically absolute silence could be heard the spark signals of the WAX as communication was carried on with the *Farnum*. The WAX was evidently not hearing the KQA well and could be heard repeating back parts of a long received message for verification, one section of which was to the effect that the *Farnum* "was aground five miles from —"

A few minutes afterward the voice of the announcer of broadcasting station KSD at St. Louis on 546 meters and close to the wave length of the WAX boomed out of the loud speaker to the effect that "The ship ran aground and was destroyed."

It was only part of the announcement of the next number to be broadcasted, a descriptive one, by a symphony orchestra at the Odeon, St. Louis, but it caused many a gasp of wonder and surprise from those listening to this Thanksgiving night tragedy of the sea. It was just another of the strange happenings which sometimes occur in radio operation and certainly was uncanny although understandable.

Amundsen's Ship Heard From by Radio

EARLY in December, Captain Raold Amundsen's exploration ship *Maud* established radio communication with Spitzbergen. The ship's position was given as 75.10 latitude north, 159.30 longitude east. This is north of Siberia near the route taken by De Long in 1881. The *Maud* left Seattle in June, 1922, carrying Capt. Amundsen and an exploration party, but Amundsen later left the vessel to make preparations for his airplane flight across the North Pole, which he subsequently postponed until next summer.

Broadcasting in Sweden

RESPONDING to the request of numerous industrial firms, the Swedish government has just authorized the formation of a broadcasting company, the Rundradiobolaget, the owners of which are representatives of Swedish newspapers and metallurgical firms. Ten broadcasting stations are to be erected, to cover the entire kingdom. The principal stations will be at Stockholm, Göteborg, Malmo and Orebro. Each will have a power of 1 kw. The Swedish government will have full control of the stations, and authorized the program of construction only after investigating the possibilities, and concluding that broadcasting would combat the tendency of the people to flock into the large cities, and also would strengthen the family by making the home more attractive.

Broadcasting in Panama

PERMISSION for broadcasting entertainment programs has been given by the U. S. Navy to the radio stations in the Panama Canal Zone, and that part of tropical America soon will hear its share of radio telephone programs. For the time being it is likely that all such programs will be transmitted by the Navy stations, as the United States is in complete control of all radio work not only in the Canal Zone, but in the Republic of Panama, by agreement with the latter. Leading Panamanians are understood to have appealed for a loosening of the restrictions to permit broadcasting.

Broadcasting in Chile

IN Santiago, Valparaiso, and several smaller Chilean cities, interest in radio telephony is growing steadily and its fuller development only awaits the establishment of a broadcasting station within the country such as those now in operation on the east coast of South America, says Assistant U. S. Trade Commissioner W. E. Embry in a report to the Department of Commerce. It is reported that the broadcasting stations recently erected in Buenos Aires, Montevideo, and Rio de Janeiro have given very satisfactory results and large numbers of amateur receiving sets have been sold in these countries. This is especially true of the Argentine where conditions for broadcasting programs are almost ideal as the land generally is flat and radio transmission carries all over the River Plate district, Uruguay, and into southern Brazil on the north and as far as the Andes on the east. For this reason, the sale of radio equipment has met with the greatest success in the country and it is now estimated that

JOHN L. REINARTZ
Daddy of Reinartz Circuit

there are approximately 25,000 sets in the Argentine Republic, in comparison with approximately 100, less than one year ago.

Denmark Listens In Before Cock-Crow

ENTHUSIASTIC radio amateurs in Denmark are always endeavoring to catch broadcasting from the United States, even though this country lies in a somewhat more unfavorable position to receive American radio messages than other European countries.

Canada Plans Radio Beacon

THE Canadian Government is about to install a powerful direction-finding wireless station at Pachena, on the west coast of Vancouver Island, British Columbia, to protect ships of all nations entering the Straits of Juan de Fuca en route to American and Canadian ports. Numerous shipwrecks have occurred in this district, and it is expected that the new radio beacon will enable vessels to determine their exact positions in foggy weather, avoiding many dangerous reefs thereabouts.

Further about Radio Beacons

By OSCAR C. ROOS, M. E.

Editor, THE WIRELESS AGE.
N. Y. City.

Dear Sir:

May I intrude on your valuable space in order to present to the readers of my article on "Radio Beacons" (page 47, October Wireless Age), some criticism thereof and my reply thereto?

I submit this matter to your attention because in spite of the fact that Dr. G. W. Pickard was—with John Stone—among the first to use the loop for direction finding in this country, there is a general impression that the Navy is the pioneer and authority on this branch of radio research and practice.

It is only common justice to call attention to the fact that the Radio Beacon System has been the subject of attack and its development has been hindered by widespread propaganda, such as meets all successful rivals of well-established conventionalized systems.

My correspondent among other things, makes this point: "The problem you treat of is one of the fundamentals of piloting. It is known as the 'three point problem' and can be plotted with a three-arm protractor with a great deal less expenditure of time and energy than by the method you describe." To this I would remark that I am quite well aware of the method, which I used in 1897, but find that the use of a double protractor-compass arrangement—which was not described—is just as quick, and the arrangement costs about one-third of the price asked for the standard "three-arm" arrangement. It is also lighter.

The use of scale and compass work was recommended for those whose knowledge of geometry would bring out the principles more clearly. It takes less than 30 seconds to locate the ship when the base angles are known.

Again my correspondent says: "The shore compass stations are used by the Navy indeed, but you did not mention that every Naval vessel is equipped with a compass, too. After years of experiment with both systems, the Navy believes the shore stations to be the more accurate. It almost stands to reason." To this I would say, the latest technique of the Radio Beacon System requires no compass whatever. It is superfluous to mention a compass in this connection and I purposely refrained from doing so.

In spite of some opinions to the contrary, the undeniable advantage of permitting *continuous* readings is peculiar to the Radio Beacon System. Any fairminded observer who has noted the relatively slow process used—for example—at the N. Y. City charting rooms, will have no doubt whatever on this point.

What hard-headed business managers think of the Radio Beacon System is indicated by its adoption on Standard Oil tankers. It was developed by engineers who demonstrated radio direction finding to the Navy in 1908.

To deprecate it is to call public attion to its merits.

Very truly yours,
O. C. Roos.

The Monthly Service Bulletin of the

NATIONAL AMATEUR WIRELESS ASSOCIATION

Guglielmo Marconi
President

H. L. Welker
Secretary

Founded to promote the best interest of radio communication among wireless amateurs in America

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The Milwaukee Radio Amateurs' Club, Inc.

THE M. R. A. C.'s technical committee investigating and reporting at meetings is now the largest and most active in the society. Mr. Doll is chairman.

Reports such as, "The Relative Efficiencies of Battery-Charger Rectifiers," and, "The Remotely Controlled System of Station 9AAP," are typical of this committee's work.

A notable example of the addresses given before the society is, "Magnetism and Some Original Experiments in its Manifestation," by Rev. John B. Kremer, professor of physics and director of station WJAZ, Marquette University. In conjunction with this a contest in defining technical terms was also popular.

A recent membership drive under the leadership of F. W. Catel, 9DTK, was very successful. A large number of Milwaukee County non-member amateurs were induced to join the club and the American Radio Relay League of which this society is a local section.

The traffic committee solicits reports of QRM for investigation. All communications to the club should be addressed to its general office, 601 Enterprise Bldg., Milwaukee, Wis., or its officers may be interviewed at the weekly meetings which are open to the public.

Romance for Editors

LETTERS from distant lands come in sounding the far-away call of the inevitable amateur, and lack of space, alone, prevents our publishing them in full.

From Grahamstown, Africa, S. W. Watson reports his reception of American broadcasting, saying that amateurs in Cape Town have recently heard music and speeches in a foreign language.

J. Bishop of Norfolk, England, writes that he has heard WGY and other American stations with only four tubes and an indoor aerial, two stages of radio frequency and one audio.

Amateurs In Continental Europe to Be Our Playmates

THE American Radio Relay League expects co-operation from the American amateurs during the Trans-Atlantic tests, December 22, 1923, to January 10, 1924, in an effort to promote better amateur communication between America and Europe.

To facilitate receiving at this end the French and British amateurs will transmit on alternate nights, the transmission hours from 8:00 P. M. until 1:00 A. M., Eastern Standard Time, the French starting the tests on December 22. Since the efficiency of our amateur transmitters was adequately proved last winter there is no reason why our fans, however enthusiastic, should "break-in" during the twenty days of testing.

By way of special inducement to insure "quiet air," $3,500 worth of prizes are to be awarded for the best reception reports turned into American Radio Relay League Headquarters, 1045 Main Street, Hartford, Conn.

Hears Across Continent on One Tube

DONALD S. REINHARDT, a fifteen-year-old fan who lives in Llanerch, Pa., recently tuned in KFI, Los Angeles, Cal., while using only a detector tube.

"Shortly after the storm had let up," he said, "I started to tune in on two tubes, but that made the static too loud, so I cut down to the detector tube. I tuned in about eleven stations, including Chicago, Davenport and Kansas City, and then I decided to begin all over again.

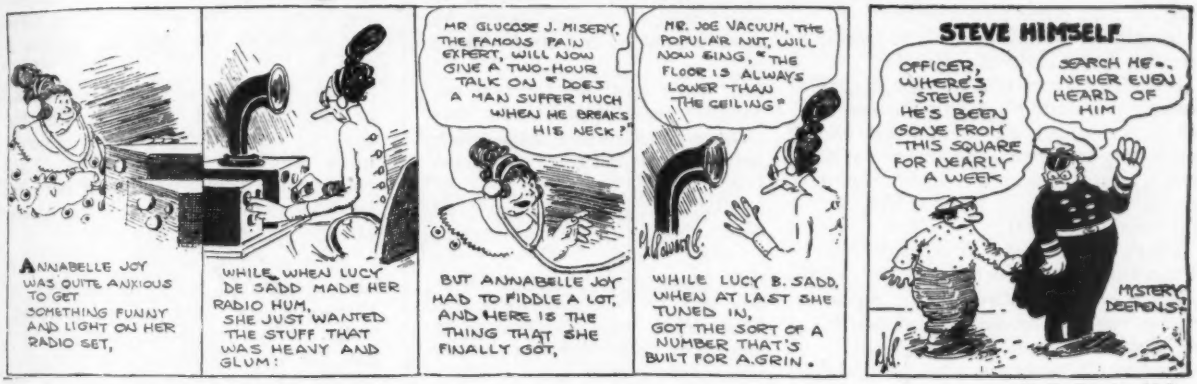
"I turned the condenser dial to zero and gradually advanced it toward the 100-degree mark. The first station that came in was one at Knoxville, Tenn., which was signing off. I moved the condenser a trifle more and caught a faint carrier wave I tuned it in and increased the volume by means of the plate variometer and heard orchestra music.

"In a few moments the music stopped and I waited for the announcer. He said 'The next and final selection will be Bebe.' The orchestra played it with a man singing the words of the chorus. Again the announcer spoke and this time he said, 'This is Station KFI, Los Angeles, Calif., signing off. Good evening, every one.'"

"I had the station between 11:30 and 12 o'clock and there can be no mistake about it as the words were plainly heard.

OFFICIALS OF THE AMERICAN RADIO RELAY LEAGUE
Seated, left to right: A. A. Herbert, K. B. Warner, F. H. Schnell. Standing: C. A. Service, Jr., J. K. Bolles, E. C. Adams, F. C. Beckley, S. Kruse and F. H. Mason

Laughter on the Radio Wave


ANNABELLE JOY WAS QUITE ANXIOUS TO GET SOMETHING FUNNY AND LIGHT ON HER RADIO SET,
WHILE WHEN LUCY DE SADD MADE HER RADIO HUM, SHE JUST WANTED THE STUFF THAT WAS HEAVY AND GLUM:
MR GLUCOSE J. MISERY, THE FAMOUS PAIN EXPERT, WILL NOW GIVE A TWO-HOUR TALK ON "DOES A MAN SUFFER MUCH WHEN HE BREAKS HIS NECK?"
BUT ANNABELLE JOY HAD TO FIDDLE A LOT, AND HERE IS THE THING THAT SHE FINALLY GOT,
MR. JOE VACUUM, THE POPULAR NUT, WILL NOW SING, "THE FLOOR IS ALWAYS LOWER THAN THE CEILING"
WHILE LUCY B. SADD, WHEN AT LAST SHE TUNED IN, GOT THE SORT OF A NUMBER THAT'S BUILT FOR A GRIN.
STEVE HIMSELF
OFFICER, WHERE'S STEVE? HE'S BEEN GONE FROM THIS SQUARE FOR NEARLY A WEEK
SEARCH ME. NEVER EVEN HEARD OF HIM
MYSTERY DEEPENS?

N. Y. Evening Mail

Ain't It Grand?

By Jack Bront

"Come, dear, dinner is getting cold and it's Nora's night out."

"Mm-m."

"John! Are you coming?"

"Just a min—" turning the knobs.

"Oh, that old radio set"

Silence.

"JOHN! Do you hear me?"

Abstractedly— "Just as plain—WJZ!—er WHAT, dear?"

"I suppose you think more of that old radio set than you do of me."

"Yes! Yes!—It IS KDKA!—Coming, dear."

"Brute! I'm going to leave this house forever. You want me to go?"

"Of course!—It is KDKA all right!"

"I'm going to pack this minute!"

"Hooray!—Here's WEAF!—Sure, Jane. Er-er What were you saying?"

Sobbing from above as the trunk lid slams shut, ready for departure.

"Oh, Jane! I've got Wanamaker's, WANAMAKER'S! Where are you? Jane!"

Silence and sobs from above.

"Oh, Jane! Wanamaker's got the greatest style show of the store! Styles just in from Paris!"

Tremulously—"Y-y-yes?"

"YEAH! Let's go down and pick out that wrap you wanted."

"Well—" reluctantly.

"Just fine, eh, old girl?"

"Uh-um! You're a dear John, and isn't that radio just grand?"

"I'LL say so. (Gr-r-r-r)."

Switches

SWITCHES may be made of metal, green wood, and hair. The use of each is different, but fundamentally all deal with electricity. Metal switches decide in which wires electricity shall flow, if any. Green wood switches generate a sensation of electricity in the hide of the small boy to which they are applied. Hair switches are almost obsolete but their theory is based on the production of electric impulses in the eye, spinal column and other parts of the beholder, generating an irresistible attraction, possibly of a magnetic character. Metal switches are frequently found in the home, while green wood switches flourish in the woodshed. Hair switches wave in beauty and other parlors, and are worn by the owner during her public appearances. They sleep on the bureau at night. Only the wood switches give pain, though sometimes the after effects of hair switches may not be pleasant. Metal switches are progressive citizens, illuminating the home, lighting the dark places of earth, turning the wheels of industry and commerce, and, when used in radio apparatus, entertaining and educating millions. When a switch of this kind is used it is customarily said to be "thrown," but there is no "bull" about this.

One of the advantages of radio oratory is that the speaker never knows when he is hissed.

Bulbs

BULBS may be made of glass, rubber, or vegetable matter. The bulbs of vegetable matter are subjects of deep interest to commuters and florists. They are planted in the ground and produce beautiful flowers in due course of nature, the weather, insects, herbivorous animals and visiting dogs, cats and chickens permitting.

Rubber bulbs are attached to various instruments of torture such as atomizers for dispensing perfume and other medicine for body and soul. In former times, rubber bulbs were also essential to a certain type of horn which was supposed to make more noise than the automobile to which it was attached, or than the pedestrian at which it was honked.

Glass bulbs have much less in them than other kinds, but much more comes out of them. Some glass bulbs produce light to shine upon the pathway. Others are more dim but possess the marvelous ability of transmitting or receiving man's speech and music across untold miles of space without the aid of wires. These are the most expensive and important bulbs of all.

The radio storm created by WGY, in the production of "Peg o' My Heart" as a radio drama, was so realistic, according to Martin L. Wyman, Jr., of Gaysville, Vt., that his father took off his headphones, saying that he didn't care to listen in during a thunderstorm.

The Wireless Age Push-Button Receiver

By John R. Meagher

To Mr. Lee Galvin of the RCA belongs all credit for originating the "Push Button Receiver." Mr. Galvin wished to give as a present to a friend a radio receiving set that would be simple and positive in operation. So he set about to devise such a receiver—and he succeeded! The photographs and text describe one adaptation of his system.—J. R. M.

IMAGINE a three-circuit regenerative receiver without variable controls!

Imagine a three-circuit regenerative receiver that doesn't re-radiate!

Imagine a complicated three-circuit receiver that a child can operate!

Imagine a receiver so designed that pushing one button lights the filaments, selects the proper wave-length and the proper regenerative adjustment for a certain station; another button for a second station and a third button for still another station!

That's what THE WIRELESS AGE "Push-Button" receiver does!

It's a standard three-circuit regenerative receiver modified as shown in the circuit diagram, figure 1.

Coupling between the plate, grid and antenna inductances is fixed. Three sliders on a portion of the secondary find the proper value of inductance to "tune in" any three stations. Three variable resistances in series with the sliders serve to adjust the degree of regeneration and the output volume. Three simple switches are used to select any one of the three slider-resistance circuits and at the same time complete the filament battery circuit.

That's all there is to it!

THE CIRCUIT

Figure 1 shows the complete tuning circuit and figure 6 represents the special home-made inductance. All coils are wound on one form; the tickler of 40 turns at one end, then a portion of the secondary—40 turns, next the untuned antenna coil—15 turns and finally a spaced winding forming the remainder of the secondary. Three sliders are arranged over this section which is wound with bare wire, No. 22, spaced with thin fishing cord.

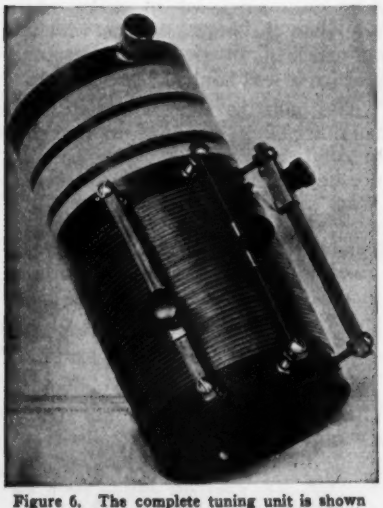


Figure 6. The complete tuning unit is shown here. Coupling between the three circuits is fixed and sliders are used to vary the inductance of the secondary

HERE is a receiver that is 'way ahead of the game! With it, it is possible to select any one of three stations by merely pushing a button—that's all!

It is an ideal set for real enjoyable entertainment—no mechanical or electrical skill whatsoever is required in its operation.

And it's easy to make—and cheap, too.

* * * * * *

We see the time when receivers like this, in locked cabinets will be rented to subscribers or equipped with nickel-in-the-slot devices for public use.

THE EDITORS.

A child can operate it

The dectector and amplifier are of standard design; in order to simplify the construction, no rheostats or jacks are used.

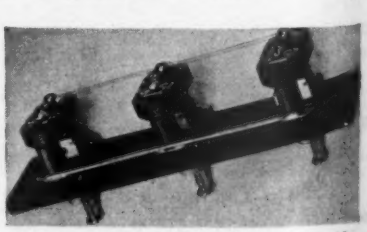
THE TUNING UNIT

The winding form of bakelite, 3" diameter, 6" long and 1/16" thick must be drilled for mounting screw holes (No. 27 drill), slider supporting screw holes (No. 27 drill) and wire fastening holes (No. 60 drill). All of these are shown in the sketches, figures 3 and 4.

Note that a space of ⅛" is provided between the coils in order that the separate leads may be distinguished more readily: Because of the slider rod supports, ½" is allowed between the antenna inductance and the spaced portion of the secondary.

In winding, leave about 6" for leads and secure the ends of the coils by threading the wire in its fastening holes. Wind the tickler first and then (in the same direction) the untapped section of the secondary and the antenna inductance. The spaced portion of the secondary is very easy to wind; secure the end of the cord and wire in the fastening holes, and make sure that both the cord and wire are free to unwind (either by arranging the spools on an axle or by laying both cord and wire full length along the floor). Lay them on the form side by side and turn the form with one hand, guiding the wire and supplying the necessary tension with the other hand. When the entire winding space of 3" has been utilized, cut the wire and cord and fasten the ends in the holes. No connection is made to this end of the wire.

The ends of the secondary that are separated by the antenna coil should be soldered and after the three sliders and rods have been arranged in place there should remain eight connections: two for the "tickler"; one for the grid; one for the ground; one for the antenna and the three sliders for the filament. And take care in arranging the sliders that the contact makes connection with but one turn at a time and that it has sufficient "spring" to insure positive connection.



The nerve center of the entire receiver; this is the push-button strip

After "drying out" the unit in an open oven a light coat of collodion may be applied to the cotton covered windings, but not to the spaced section of the secondary as the fishing cord is already water-proofed.

Put the form away until the detector and amplifier and push-button sections have been made.

THE PUSH-BUTTON STRIP

This is the "nerve center" of the entire receiver for it is the only visible means of "wavelength" selection and also automatically selects the regenerative adjustment and opens and closes the filament battery circuit. In addition, it is the easiest part to make!

The strip is of bakelite (though hard wood would be satisfactory) ½" wide, 6" long and ¼" thick. It is drilled (figure 5) for three Cutler-Hammer battery switches which are arranged with the long sides parallel. The dust-proof fibre casings on the switches are removed and the three bridging "U" shaped shorts are connected to each other and to the metal frames with flexible leads. (This is connection 5 in figure 1.) The three lower terminals of the switches are connected together with a bus bar. (This is connection 4 in figure 1.) There remain three separate contacts, one on each switch to which the sliders and potentiometers are connected (figure 1).

THE DETECTOR AND AMPLIFIER

If it is desirable the detector and amplifier may be mounted in a separate cabinet; any detector and two-stage amplifier may be used if connections for a "tickler" are provided.

However, in order to make the entire receiver compact, both the tuning unit and tube section should be laid out on a base of hard rubber or wood in the manner of the receiver illustrated. This panel is only 7 by 10 inches, but a larger one is specified in order that plenty of room will be available for fully mounted audio frequency transformers.

Gather together all the parts and arrange them on the panel in the best manner. Then mark and drill the holes.

Note that connections to the sockets are brought through the panel and in this way wiring is restricted to the under surface. This is done by replacing the terminals with longer brass screws (⅝", 6/32) which will extend through the socket and panel. Small 6/32 hexagon brass nuts are used to clamp the contact springs in place and the spring, nut and screw are soldered together to prevent loosening and to insure a perfect connection.

Four holes, identical with those in the socket are drilled in the panel and the projecting screws go through them and are clamped with other hexagon brass nuts. These serve not only for connections, but also as a means of fastening.

MATERIAL

The trade name of the parts used in the "Push Button" receiver are given in parentheses; however, one should not hesitate to choose other makes if they are of equal merit.

- **3 standard sockets. (Paragon).**
- **3 battery switches. (Cutler-Hammer)**
- **2 audio frequency transformers. (General Radio)**
- **3 400-ohm potentiometers. (Tilman)**
- **7 binding posts. (Eby)**
- **1 sub panel, 7"x14"x3/16". (Radion)**
- **1 switch strip, 1½"x6"x¼". (Bakelite)**
- **1 .00025 mfd. grid condenser. (Dubilier)**
- **1 1-megohm grid leak. (Radio Corporation)**
- **1 .0005 mfd. fixed condenser. (Dubilier)**
- **1 inductance, form 3"x6", ⅛ lb. No. 30 D. C. C. wire, ¼ lb. No. 22 bare soft drawn copper, spool of thin fishing cord, 3 sliders and three 4" slider rods.**
- **4 strips of bus bar.**
- **2 strips of black cambric tubing.**

Seven connectors, consisting of brass machine screws and nuts are arranged in the panel near the tuning unit. Flexible connections from the unit are soldered to them and they are wired underneath to the rest of the circuit.

Screw the push-button strip in place and wire the entire receiver, using bus bar and soft drawn copper covered with small black cambric tubing.

Finally, attach the tuning unit to the panel with small brass machine screws and nuts and solder the leads to the proper terminals.

The receiver should be placed in a cabinet which may have a polished wood front—only the three push buttons will show. Small card holders should be arranged above each button and an appropriate card containing the name or call letters of the station inserted in each one. Incidentally, the cabinet should be provided with a hinged top as it is necessary to get at the "works" when the receiver is installed.

OPERATION

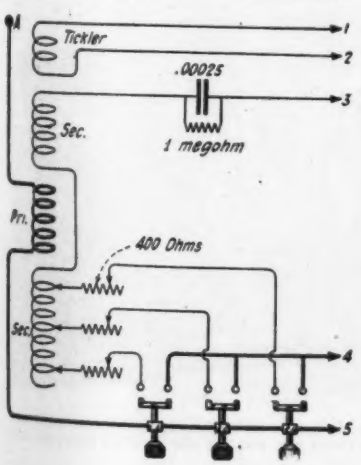
UV-201A (C301-A) tubes are used throughout so a storage battery of 6 volts with a six-ohm rheostat in one lead should be connected to the A battery binding posts on the receiver.

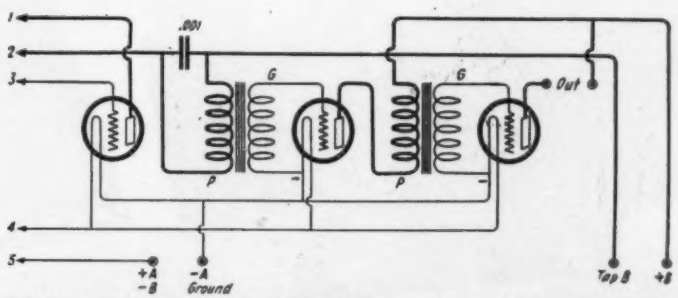
Connect the B battery, loud-speaker, antenna and ground to the proper binding post.

Set all three levers so no resistance is in series with the sliders and the filament.

Then, with one Cutler-Hammer switch "out" vary the slider connected to that switch until the "carrier wave" of a station is heard. Leave the slider there and increase the resistance of the "potentiometer" connected to that slider until the whistle ceases and the broadcasting is audible. Further increase of the resistance will decrease the signal strength so the desired volume may be secured by manipulating that control. Try readjusting the slider a turn or so and leave it in the best position.

Push in that button and the filaments will "go out." Pull out one of





Figures 1 and 2. Note the remarkable simplicity of the circuit used in the push-button receiver. As may be noted in Figure 1, three switches are so arranged that they may cut in separately a certain amount of resistance and a certain value of inductance for a certain wavelength. In addition the filament circuit is made or broken by the action of the switches. Complete details about this unique system are given in the text

the other buttons; the filaments will again light; and proceed to tune in some other station—preferably a local. Adjust the volume as before. In a similar manner, select a third station and adjust the signal volume.

In other words, all we do is to adjust one slider and one resistance at a time, the slider determining the wavelength and the resistance the amount of regeneration desired.

Having calibrated all three "buttons" so as to receive the three best stations, shut up the cabinet, lock it if necessary, and that's all!

The Push-Button Receiver is the second of a series of sets made in THE WIRELESS AGE *workshop and described in detail in* THE WIRELESS AGE.

We have many splendid receivers in the process of construction; all of them are of the latest type; some have unique features which make them not only efficient but also new and interesting. To mention a few: One is a one-tube reflex that is just about the best one-tube set that has as yet been described; another is a more complicated tuned radio frequency amplifying receiver that is capable of exceptionally long distance reception; there is a splendid super-heterodyne, too, that is cheap and easy to make.

All of these and a wealth of technical constructional articles are planned for near issues of THE WIRELESS AGE.

The Push-Button Receiver is on display in The Wireless Age office at 326 Broadway, New York City. Come in and examine it when you are in the city.

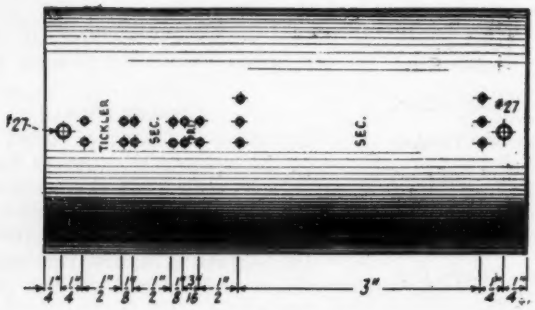


Fig. 3

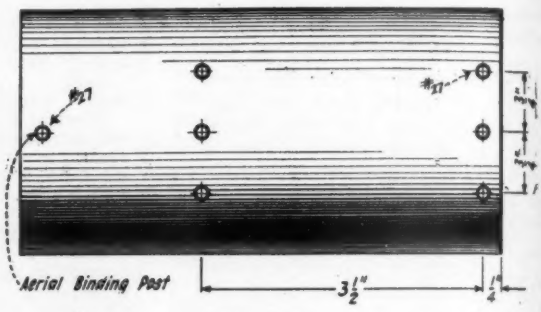


Fig. 4

Figures 3 and 4 above. These sketches represent the winding form for the tuning unit

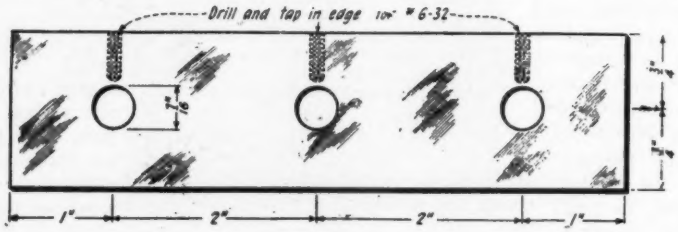
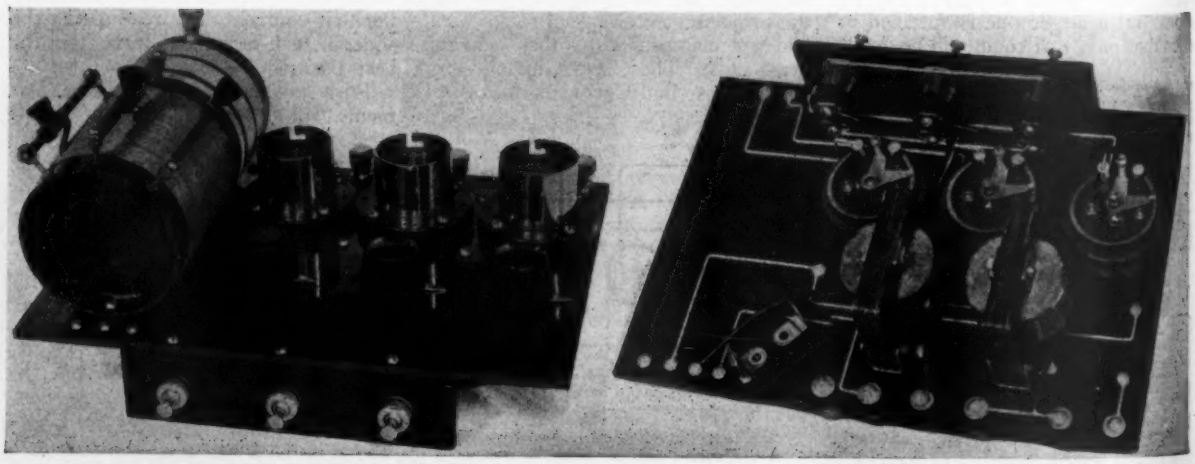


Fig. 5

Figure 5. Panel layout of the push-button strip



The inside works of The Wireless Age push-button receiver; the left hand view shows the sub-panel with the tuned unit and push-button strip in place. The knobs control the amount of resistance in the circuit. A bottom view is shown on the right-hand side and one may note the simplicity of the wiring

Radio Frequency Amplification, Regeneration, and the Single Circuit Receiver

By Donald Gordon Ward

Associate Member Institute of Radio Engineers

FROM some unknown point the idea has been gradually seeping into the amateur fraternity that it is impossible to employ radio frequency amplification with regeneration and especially impossible to employ radio frequency amplification with the single circuit receiver. Just where this idea originated, no one seems to know, but it is to be supposed that it was because some experimenter who had very little experience with radio frequency amplification tried to apply one of the original type of radio frequency circuits to his regenerative receiver, and not being able to accomplish anything in the way of results, he immediately drew the conclusion that it was impossible to employ radio frequency amplification with any type of regenerative receiver.

The first statement to be made in connection with this article is that this idea is false and one which should be immediately dispensed with before it does any more harm to the radio game.

Another false impression which has been held by many radio experimenters, is that it is impossible to use radio frequency with the single circuit receiver. The time and place of birth of this idea is also rather vague, but it probably also came from the same source that was responsible for the first erroneous idea concerning regeneration and the radio frequency amplifier.

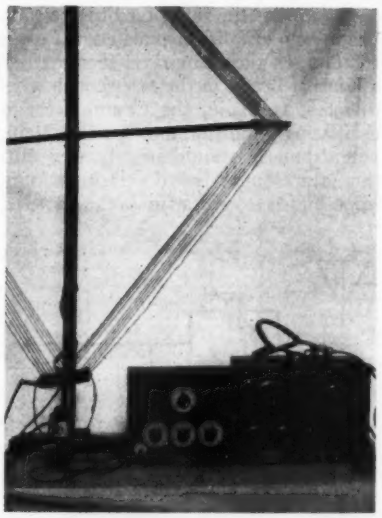


Figure 1. Some of the apparatus used in the first experiment which the author conducted to learn if radio frequency amplification could be used to advantage with a regenerative receiver

During the process of the unfolding of this article we will not only show how to employ regeneration with the radio frequency amplifier and how to use radio frequency amplification with the single circuit receiver, but we will also demonstrate the use of radio frequency amplification, regeneration and the single circuit receiver, at one and the same time.

This article is the result of a number of experiments with standard apparatus at the Radio Institute of America, which extended over a considerable length of time and is very convincing as to the results which were produced. Various types of signal energy were received, such as the radio frequency from a buzzer driven wavemeter, signals from a distant spark transmitter, signals from a distant C.W. transmitter, and signals from a small C.W. calibrated oscillator using both A.C. and D.C. as the source of supply of the plate potential.

The following apparatus was employed in making the tests.

One standard RCA short wave loop type AG-1380 with variable condenser. One 3-stage radio frequency amplifier, General Electric Co., AA-1520. One Westinghouse RC receiver, complete with tuner, detector and 2 stages of audio frequency amplification. One General Electric single circuit tuner, type AA-1300. One General Electric detector and 2-stage audio frequency amplifier, type AR-1400. One single-circuit Armstrong regenerative receiver employing the Reinartz circuit.

The first set-up used is illustrated in the figure 1. The apparatus used was as follows, Radio Corporation loop with variable condenser, type AG-1380, General Electric, 3-stage radio frequency amplifier, type AA-1520 and Westinghouse RC receiver.

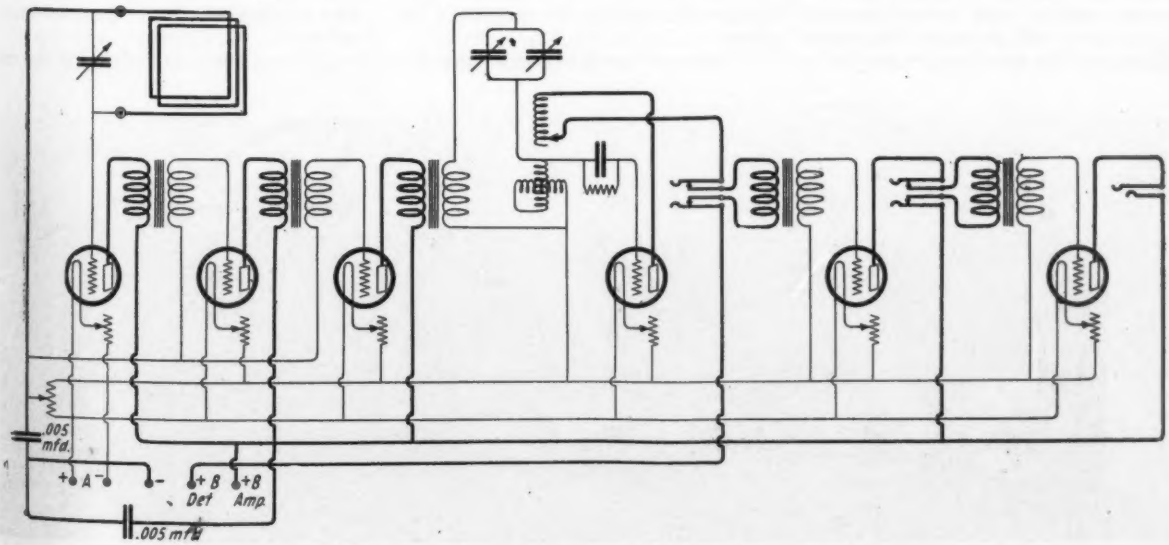


Figure 2. This is a circuit diagram representing the hook-up of the equipment shown above

The radio frequency waves were picked up by the loop and converted into radio frequency currents in the loop and condenser which formed the first oscillating circuit. The output of this circuit was fed through the three stages of radio frequency amplification and thence to the tuner of the RC receiver and from there to the detector, where it was rectified in the usual manner and then passed on to the audio frequency amplifiers. The circuit figure 2, gives the complete wiring diagram of this connection.

In operating this circuit it must be very carefully adjusted so that the radio frequency amplifier does not oscillate, for if two radio frequency signals are locally generated, one by the radio frequency amplifier, and the other by the regenerative receiver, and a third radio frequency is picked up by the aerial, a very curious conglomeration of sounds in the receivers will be the result. This is taken care of by means of the stabilizing potentiometer which is mounted in the radio frequency amplifier, and a small amount of experience will show just the proper adjustment for the best results in so far as signal reception and freedom from extraneous noises are concerned. The circuit should be adjusted by means of the stabilizing potentiometer, until, with the tickler coil adjusted to the minimum position, it does not oscillate.

The best test for oscillation is to tap the antenna post of the radio frequency amplifier, which under the conditions of this test is the input post of the radio frequency amplifier, marked G, or in some cases the unmarked terminal. If a click is heard in the telephones when this test is made, the circuit is in an oscillating condition and the stabilizing potentiometer should be adjusted until this is no longer heard. If it is found impossible to so adjust the potentiometer to prevent this oscillating condition, it is due to the fact that the tickler coil is causing the oscillation, so it should be temporarily short-circuited. The adjustment of the stabilizing potentiometer is quite critical, but after it has been once adjusted it is not necessary to move it unless new tubes are put into the radio frequency amplifier.

The next move is to remove the short circuit around the tickler coil, if one was put on, and adjust the tickler coil until the circuit again oscillates as will be shown by making the same test for oscillation as was made before. The circuit is now ready to be tuned.

If it is found that the signals from the local stations come into the loop with such an intensity that it is difficult to separate the stations one from another, the number of stages of radio frequency which are being used may be reduced by simply turning out the filaments of the radio frequency amplifiers. If only two stages of radio frequency are desired simply turn out the filament of the third stage radio frequency amplifier. If only one stage is desired, turn out the filaments of the second and third stages, but do not under any conditions remove the tubes from the sockets as this will cut out the signals entirely. With the filaments turned out and the tubes in the sockets the radio frequency energy is fed through the tubes, through the condensers formed by the plate-grid capacity of the elements of the tubes themselves.

One supreme advantage of the use

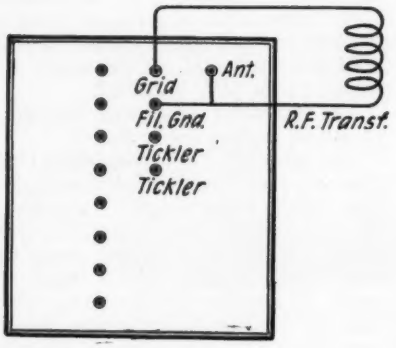


Fig. 3

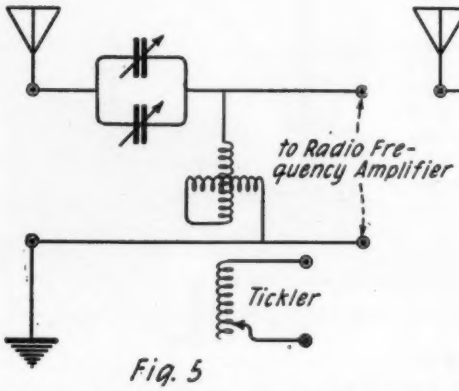


Fig. 5

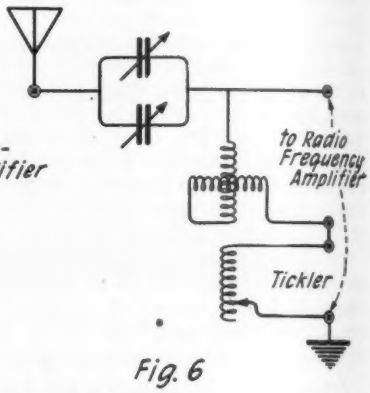


Fig. 6

Various tuning systems may be used in conjunction with the radio frequency amplifier

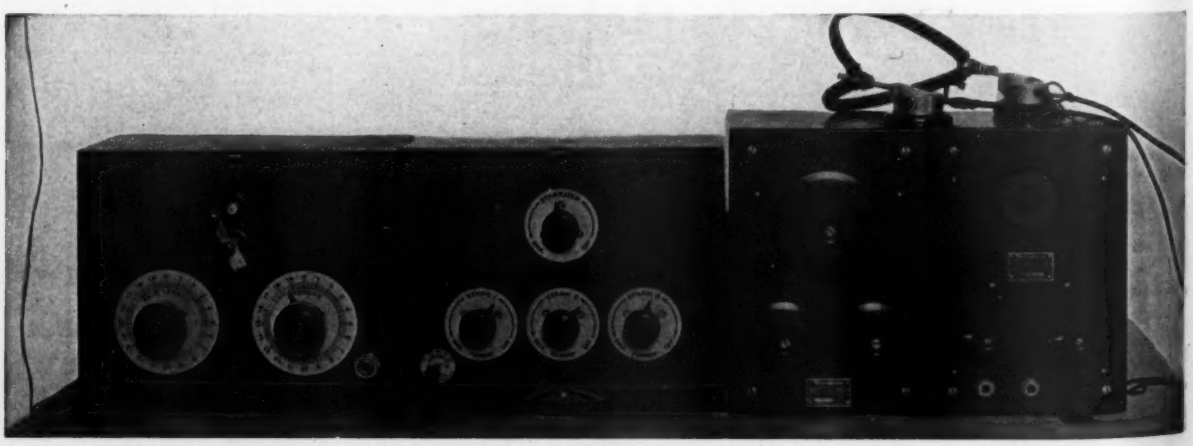


Figure 4. In his second experiment the author used a single circuit tuner instead of the loop—and the set worked well

of the radio frequency amplifier, outside of the fact of the increase in receptive range, is the action of the radio frequency amplifier in preventing any radio frequency which might be generated in the receiver itself from passing out to the antenna and interfering with all of the receivers in the immediate vicinity.

It might be mentioned in passing that very few of the receivers which are in use at the present time are handled with any consideration of our neighbors' feelings. If we wish to receive signals, we simply turn up the tickler coil to a point that throws the receiver into an oscillating condition which gives the neighbors who are listening in on the same program around us the "benefit" of our radiated energy. The entire basis of this trouble lies in our wishing to push our receivers to the maximum limit without any consideration of the fact that the overloading of our receivers and amplifiers results in deterioration of our outfit, which, though it is not immediately apparent, finally shows up in the form of various breakdowns, such as burned out transformers, burned out receivers, connections which open and close, giving rattles in the ear phones and many other troubles.

When it is appreciated that the receiver and amplifier tubes are meant for a certain service, and that any attempt to seriously overload them will not benefit the listener anything, but on the contrary will only damage his apparatus and produce the most horrible form of reproduction, then at last will the broadcast public begin to get real enjoyment from its reception of broadcast programs.

To return to our circuits, the General Electric receiver may be used with its accompanying detector and audio-frequency unit in place of the Westinghouse RC receiver. The diagram of this connection is not given as it is almost exactly the same as that of the Westinghouse unit.

A second method of using the same units as were referred to in the first set of tests, includes the Westinghouse RC set with the primary tuning condensers—which are normally connected in series with the antenna circuit—connected in shunt with the primary. This may be accomplished by making the input and output connections to the receiver as illustrated in figure 3, which gives a view of the RC set taken from the back and shows the location of the binding posts.

If it is not desired to use the loop aerial as a pick-up device it is possible to use another tuning element with an aerial and a ground instead of the loop and tuning condenser. Figure 4 illustrates this set-up.

The diagrams, figures 5 and 6 show the connections necessary to use this tuning element. It is unnecessary to include the radio frequency amplifier or the regenerative receiver with the detector and audio frequency amplifier as the connections of these pieces of apparatus remain unchanged. In the diagram figure 5, the tuner is used with its normal connections, that is, with the aerial and ground connected to the aerial and ground posts of the tuner while the output of this tuner is connected to the input of the radio frequency amplifier unit.

In the diagram figure 6 another con-

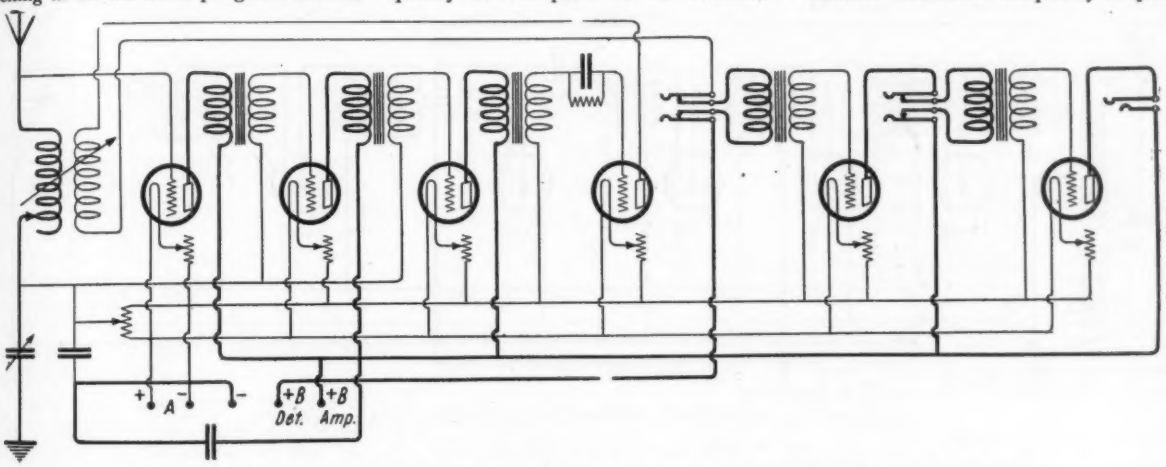


Figure 8. Hook-up of a single circuit receiver with three stages of radio frequency amplification and regeneration

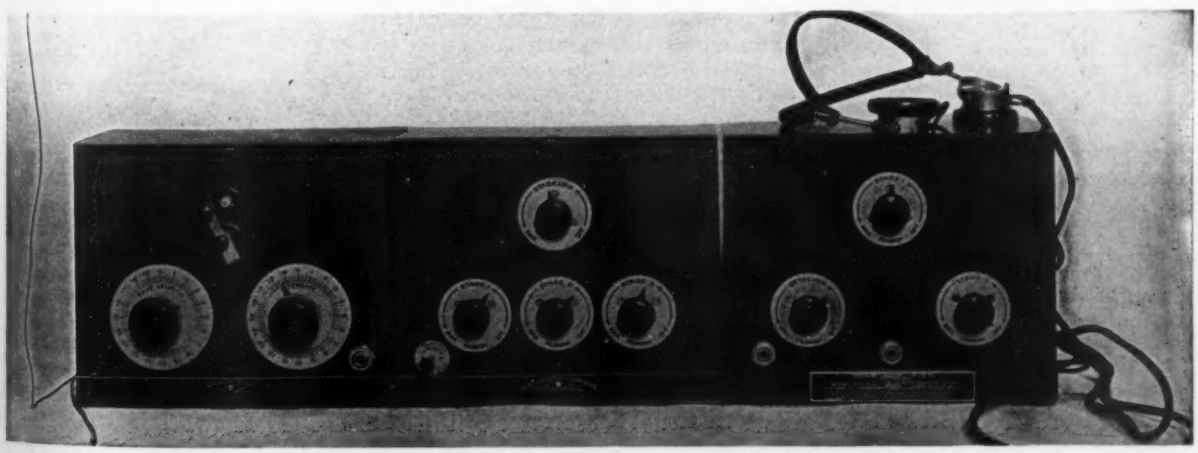


Figure 7. This is the equipment represented in the circuit diagram of Figure 8

nection is shown in which the tickler coil is made use of as an additional inductance for increasing the wavelength of the antenna circuit in case we have a very short aerial and wish to receive on higher wavelengths than would otherwise be possible.

In case it is desired to still further increase the range of the receiver, the tuner may be connected as illustrated in the sketch figure 3, and the aerial and ground must then be connected to the grid and ground terminals respectively. A small aerial must be used with these connections, because if a large aerial is used, it picks up so much radio frequency energy that it is difficult to separate one station from another, while if a small aerial is used it may not be possible to go up to the higher wavelengths because we have not enough inductance and capacity. Therefore it is best to use the tuning elements with the maximum amount of inductance and capacity which they possess and connect them in a circuit where they have the real control of the tuning instead of having the maximum of the inductance and capacity in the aerial where it cannot be controlled.

It might be mentioned that it is possible to use the Reinartz receiver in place of either one of these receivers in the above tests and there is no reason to presume that it would not be possible to use any single circuit receiver though it is not considered in this article because no other type of single circuit was available for the tests and it was felt that it would be safer to stick to circuits that had been actually tested and not to include those circuits which, though according to all theory they should work in these setups, had not actually been tried and the results noted.

In a further set of tests the radio frequency amplifier unit was connected between the tuner, which is employed regeneratively and the detector and audio frequency amplifier unit. Under these conditions, instead of having only one radio frequency impulse, fed through the radio frequency amplifier, namely; the incoming radio frequency energy from the aerial, there are two:—first, the incoming radio frequency energy, and second, the radio frequency component of the plate current of the detector tube, when the tube is oscillating. As these two radio frequency impulses are only slightly off resonance relationship one with the other, one of them will be fed through as efficiently as the other. As the radio frequency amplifier will not pass any audio frequency currents, even if the audio beat note is present in the tuning elements it will not pass through the radio frequency amplifier and the beat note that will result must come from the beating together of these two radio frequencies after they reach the detector circuit.

As shown in figure 7 the apparatus used was the General Electric units throughout.

The diagram figure 8 gives the scheme of connections of this receiving equipment and in connection with this receiver it is well to mention some of the points to be observed in its operation. The first step is to tune in the station desired with the tickler coil adjusted in minimum position so that it does not oscillate. Next adjust the radio frequency amplifier until it does not oscillate as in the manner previously mentioned; now readjust for oscillating condition with the tickler coil. The least amount of regeneration that can be used while obtaining desired

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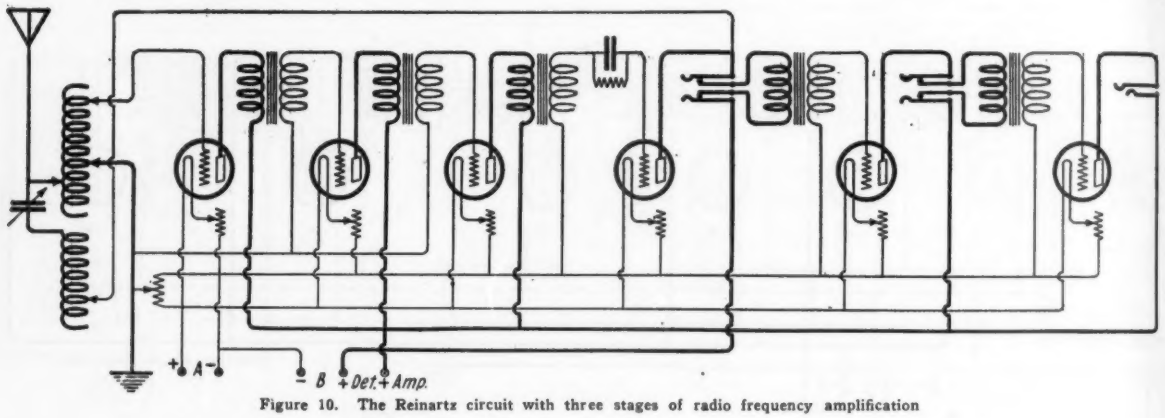

Figure 10. The Reinartz circuit with three stages of radio frequency amplification

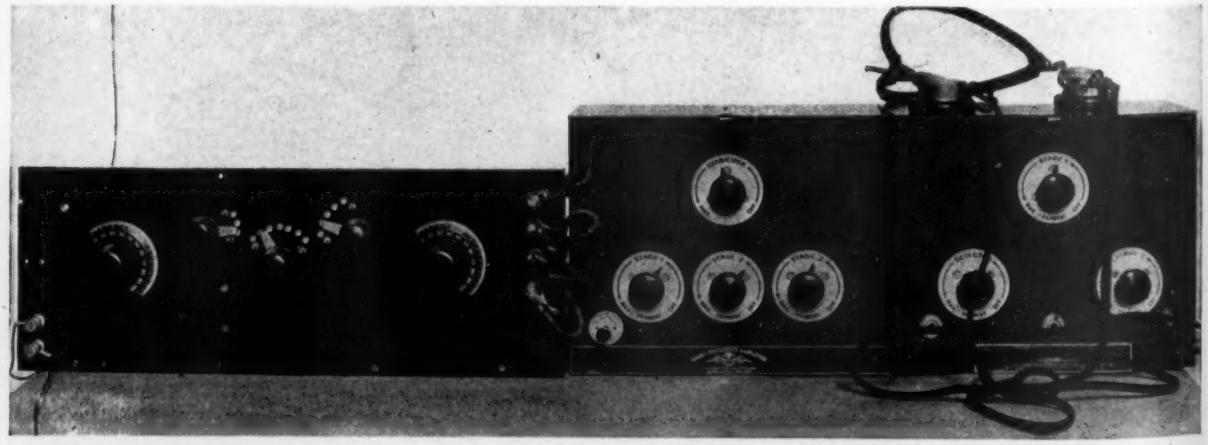

Figure 9. A Reinartz set connected to a General Electric three-stage radio frequency amplifier and a detector and audio-frequency amplifier

An Efficient Speech Amplifier and Its Application for Phone, ICW and CW Transmission

By K. M. McIlwain

THE popular theory in the past that it was absolutely necessary to have a D.C. generator or a bank of "B" batteries to supply the plate potential for the speech amplifier tube in radiophone work is fast dying out and the understanding and adoption of the circuit that I have here drawn out and am going to explain in detail will prove that the above mentioned popular theory is a fallacy.

I am under the impression that a great many amateurs are using 500-cycle A.C. as a source of power for their radio transmitters so I will carry on the following discussion assuming a 500-cycle source of energy, and explain how it can be used for the filaments and the plates of the tubes in the speech amplifier unit and then show how, after installing this system, it is possible to shift from phone to I.C.W. and then to C.W. by a simple switching arrangement.

Figure 1 is a schematic diagram of the speech amplifier unit, and after completing the discussion on this circuit, another schematic diagram will be shown of the oscillatory circuit and the method of coupling it to an antenna for greatest efficiency and stability of operation.

The Power Transformer

The Radio Corporation UP-1368 power transformer is perfectly alright for use in this circuit even though we have a 500-cycle source of supply. At first glance there may be a question in your mind as to the adaptability of this transformer to 500-cycle energy since it was designed for operation on a 60-cycle circuit. It will work efficiently on 500 cycles and I'll tell you why. To begin with I'll make the following statement: You can use a 60-cycle transformer on 500 cycles but you can't use a 500-cycle transformer on 60 cycles without overheating the core.

The magnetic flux threading the core of any transformer is equal to the product of the impressed voltage and a constant (100,000,000) divided by the product of the frequency and the number of turns in the primary of the transformer and another constant (4.44). Writing it out, the formula looks like this:

$$\text{Total flux} = \frac{Ei \times 10^8}{f \times t \times 4.44}$$

where: Ei = the impressed voltage
f = the frequency of the impressed voltage
t = the number turns in the primary winding.

In the design of transformers, a safe allowable flux density (number of lines of force per square inch of core area) is about 65000, therefore, the number of square inches necessary to carry the total amount of flux as determined by the above formula, is equal to that value obtained, divided by 65000. Writing this formula out we have:

$$\text{Sq. inches} = \frac{\text{Total flux}}{65000}$$

Going back to the first formula. The only value that we are interested in in this discussion is the frequency f, all the other values remain constant. If we were designing a transformer for duty on a 60-cycle source we would have the value 60 substituted for f in the first formula and if we were designing it for a 500-cycle source, we would have the value 500 substituted in place of f. Now, by comparison, it can be readily seen that by having 60 in the denominator of the formula under consideration we are going to have a value for the total flux that will be more than eight times the value we would get if we had 500 in the denominator instead of 60. Now, considering the second formula, we can see that with 60 cycles we would need more than eight times the core area that would be necessary for 500 cycles, so it can be readily seen that a transformer designed for 60 cycles will have more than enough core area for 500 cycles, while a transformer designed for 500 cycles will not have near enough iron to carry the flux that would thread the core if 60-cycle energy were applied to the primary. So you will be perfectly safe in using the 60-cycle transformer mentioned on your 500-cycle source of power.

SOME real, authoritative "dope" on amateur C.W. transmitters is given in this article by Mr. K. M. McIlwain, a noted expert on the subject. The information will be of much interest to 200-meter experimenters.

The beauty of using this transformer is that you really have three transformers in one. One secondary winding supplies the plate voltage for the two kenotron tubes, a second winding supplies the filaments of the two kenotrons with current (this winding being insulated for 1100 volts), and the third winding supplies the filament current for the 5-watt speech amplifier tube.

Rectifier

The rectifier tubes used are UV-216's and they are rated at 20 watts output. Two are used to give full wave rectification. A PR-535 filament rheostat is put in series with the filament lead of each of these tubes to get the proper control. This, of course, is necessary so that you will be able to prolong the life of the tube by cutting down the filament supply to get normal efficiency of operation with minimum amount of filament current. These rheostats should be connected into the circuit so that they each have their two resistance coils in parallel. In this way they each will offer a resistance of 1.5 ohms and will each carry a current of 2.5 amperes. No other way of connecting in this rheostat will do since any other combination is only rated at 1.2 amperes and as these tubes each draw 2.35 amperes there would be an unnecessary heat loss in the rheostat windings.

Filter

The wire to supply the plate voltage for the speech amplifier tube is tapped off the mid-point of the kenotron filament winding, but before it gets to the plate it passes through a refining or filtering process that irons out the

1000-cycle ripple that predominates at the start. If only one rectifier tube were used only one side of the 500-cycle wave would be rectified and we would only have one ripple per cycle, but when two kenotrons are used we have double or full wave rectification and consequently get two ripples per cycle which means in this case a 1000 cycles. The first series circuit that it comes to is a 1000-cycle trap which is no more nor less than an application of the much discussed anti-resonant circuit (wave trap) used in the antenna leads of receiving sets to eliminate undesirable transmitting stations while listening to some desired signal on another wave length. It is composed of a UP-415, 1. henry reactor in parallel with a .025 mfd. condenser. By substitution in the following formulas it will be seen that 1000 cycles is the frequency of a 300,000 meter wave and that 1. henry and .025 mfd. tune to this wave length.

$$\lambda = \frac{3 \times 10^8}{f} = \frac{3 \times 10^8}{10^3} = 300{,}000 \text{ meters}$$

$\lambda = 59600 \sqrt{LC} = 59600 \sqrt{1000} \times .025 = 300{,}000$ approx.

where: λ = wavelength

L = inductance in milli-henries (1. henry 1000 mh.)

C = capacity in micro-farads.

It is the property of a parallel circuit tuned to a given frequency to offer an extremely high impedance to that frequency when connected in series in the circuit containing energy of that frequency. Thus the trap offers a high impedance to the 1000-cycle ripple.

On either side of the trap, connections are made to two UC-488 condensers (1. mfd. each), the other side of these condensers being connected to the negative side of the rectified supply from the kenotrons, which is the mid-point of the secondary winding which supplies the plate voltage for the two kenotrons. It is to be noted that this negative side is kept off of ground as far as D.C. and speech frequencies are concerned, the only ground connection being a radio frequency ground through a UC-488, 1. mfd. condenser. The reason for this will be explained later.

A radio frequency choke coil is added between the 1000-cycle trap and the plate of the speech amplifier tube. This is simply another UP-415, 1. henry reactor.

SPEECH AMPLIFIER TUBE

This tube is a UV-202, 5-watt radiotron, one of the most popular tubes for amateur transmission. We now have, after the filtering that it has gone through, a pure supply for the plate of this tube. It is so far from 1000 cycles that we will call it D.C. This D.C. voltage depends upon the voltage that is applied to the plates of the kenotrons and the per cent. of rectified voltage to 500-cycle voltage to be expected is about 55 per cent. Therefore, if there is a potential of 550 volts on the plates of the kenotrons we would expect to get about 55 per cent. of that value or 300 volts on the D.C. side. A connection is run from the plate of this tube through a blocking condenser to the grid of the modulator.

The filament of this tube is supplied with current from the secondary winding of the power transformer set aside for this purpose. The mid-point of this winding is connected to the common negative. The grid is connected to one side of the secondary winding of a UP-414 microphone transformer. From the other side of this winding a connection is made to the negative bias battery which for this tube functioning under these conditions you will find to be best at some voltage between 6 and 9. The positive side of the bias battery is connected to the common negative, which in turn, is connected to the grid of the modulator tube through a UP-414, 1. henry reactor.

MICROPHONE CIRCUIT

This circuit is composed of a standard microphone and 6-volt battery in series with the primary of the UP-414 microphone transformer mentioned above. The battery may be either a 6-volt storage battery or one made up of four 1.5 dry cells in series. The storage battery of course is preferable although not absolutely essential. There is a side tone winding on this transformer which may be connected to the telephone receivers by means of a double-pole double-throw switch as shown in figure 1; this is desirable during transmission as it allows the operator a means of checking up on the operation of his microphone. This is really a very essential point because often in the course of conversation the operator will allow the position of the microphone, relative to the voice waves emitted from his mouth, to change so that he will be speaking into it at an angle. This will cause the microphone to function inefficiently and it will be noticeable immediately if the telephone receivers are connected to the side-tone winding.

The only way to talk into any kind of microphone whether it be in a radio phone transmitter or an ordinary land line telephone, is to hold the microphone in such a position relative to the voice waves coming from your mouth as to cause these waves to strike the diaphragm perpendicularly. The common practice so prevalent in many offices of carrying on a telephone conversation with the microphone up around the side of the face somewhere is mighty poor practice. If we are going to use a certain kind of apparatus we might as well use it to produce highest efficiency.

Before going on to describe the oscillatory circuit it might be well to add

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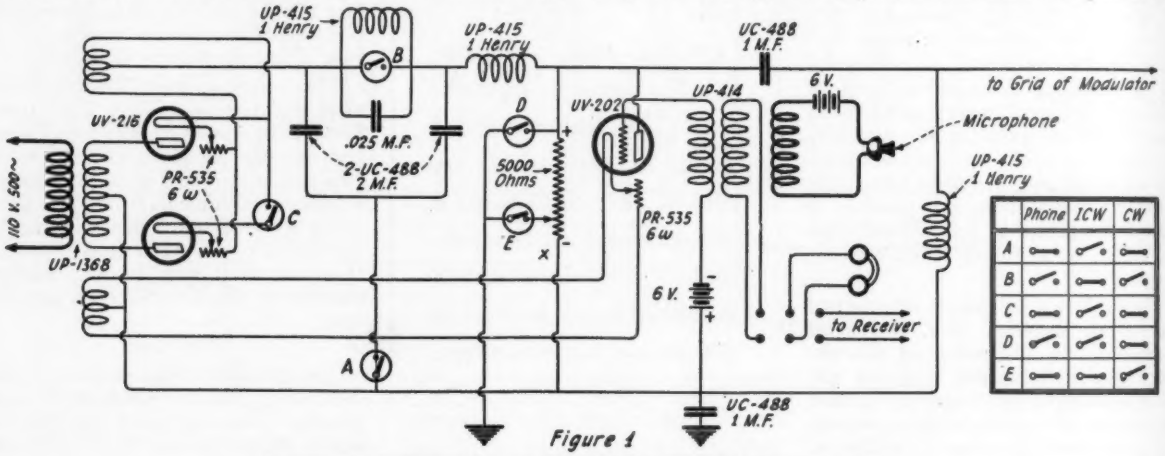
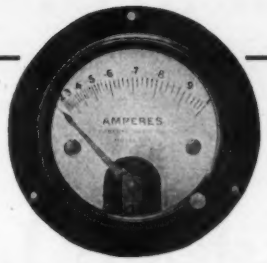


Figure 1

Complete circuit diagram of a splendid speech amplifier for amateur transmitters

THE TEST TABLE

A REGULAR MONTHLY DEPARTMENT OF AUTHORITATIVE INFORMATION ABOUT RADIO APPARATUS



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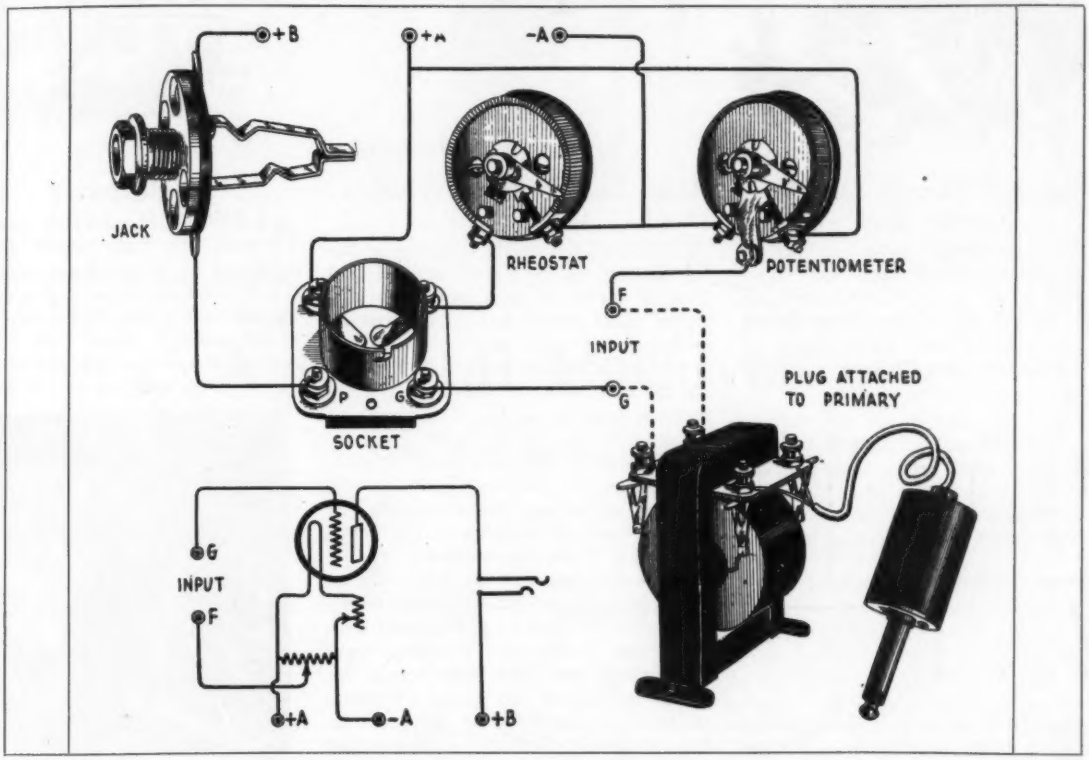
R. P. CLARKSON
AUTHOR
RADIO DATA SHEETS



A UNIVERSAL TEST ASSEMBLY

Just a socket, a rheostat, a potentiometer, and a jack! These form a universal test assembly when connected together as shown in the picture hook-up and repeated in the diagram. From the plus and minus A binding posts, leads go to the A battery of your regular set. If you have less than about 80 volts of B battery, connect another block of B battery to the present amount. The minus of the new block will connect to the last plus of the old and the free plus end of the new block will go to the binding post marked plus B.

With a hard tube, an additional step of A. F. may be tried out. Connect the secondary of any A. F. transformer to the input of your test assembly, connect a regular phone plug to the primary and plug in where you usually plug in your receivers. You may have to reverse the connections of the plug to the primary so that the tip and sleeve of the plug will connect up right to the contacts in the jack. Put the potentiometer arm over against the minus post. The effect of various transformers may be tried and the correct one chosen.

The same hook-up makes a step of R. F. Just substitute an R. F. transformer for the A. F. Connect the secondary to the input. Connect the plug to the primary. Short circut the grid condenser and leak on your detector with a piece of wire. Put a grid condenser and leak on the test set between the input terminal G and the socket. Put the detector tube in the test set socket and the amplifying tube in your regular detector socket. Change the detector B battery lead to the binding post on the test set and the test set B battery lead to the detector post on the regular set. Turn the potentiometer arm over against the plus terminal, plug the transformer in on your detector jack and your head phones in on the test set jack and there you are. The plate variometer or tickler will also require short circuiting.

A VERSATILE HOOK-UP

With the test assembly, an amplifying tube and one each of R. F. and A. F. transformers, you can amplify the local programs by using the A. F. as shown. Then later in the evening, switch to the R. F. transformer as described and go for distance. Take care that the leads from the R. F. transformer are kept short.

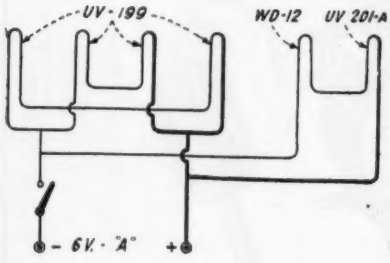
Every once in a while some old idea pops up as a new hook-up. You can try any of them with the test assembly shown. It has all the elements of any detector or any amplifier. Across the battery is a potentiometer so that the input lead from F may be carried either to plus or minus filament or to any intermediate point, thereby regulating the grid bias. When used independently, minus B battery will connect with plus A and Plus B goes as indicated.

To try out reflex, for example. Plug in on the test jack the primary of an R. F. transformer, connect its secondary, a crystal and the primary of an A. F. transformer in series, as usual, and connect the secondary of the A. F. transformer across from the input terminal G to the socket. Shunt this secondary with a .001 condenser, connect the input terminals to your tuner, and put your phones in between the B battery and the plus B binding post. Another .001 or .002 condenser across between the binding posts plus B and plus A will be of advantage. Use a hard tube.

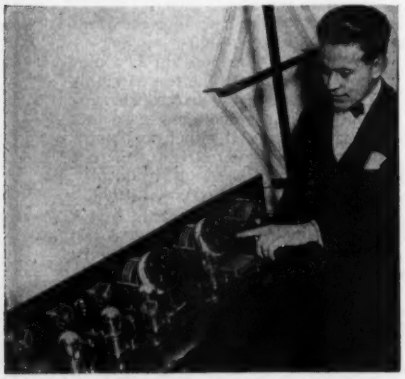
Workshop & Laboratory

Filament Circuit for the Uni-Control

MANY amateurs wish to secure greater volume than the small UV-199 tubes in the Uni-Control afford. By the use of the circuit shown here, the second and third stages of audio-frequency amplification are used



in conjunction with a WD-12 and a UV-201-A tube, respectively. The total current consumption with this arrangement is approximately .37 amperes. This system will give louder reproduction than would be had if UV-199's are used throughout. The rest of the circuit may be exactly as shown in the description of THE WIRELESS AGE Uni-Control published in the December issue of THE WIRELESS AGE.



Mounting radio frequency transformers in tuned RF amplifiers at all sorts of peculiar angles seems to be quite a popular practice. Just why the special arrangement shown above was used is not clear, however, as the windings are in the same plane

Uses Leaded Glass Window for Lead-in

A CHICAGO radio fan whose receiving set is placed on a buffet close to a row of windows containing leaded glass panels has found that by soldering the aerial wire to the outside of the leaded glass frame, and soldering the connection to the receiving set antenna binding post to the inside of the leaded glass, a perfectly good insulated lead-in wire was secured without having to drill any holes in the sash, or utilize any porcelain tubes or other means of bringing in the aerial connection from the outdoors.

Such an idea will work on almost any kind of leaded glass window where the leaded portions do not connect with a wooden frame, and in many ways the arrangement has been found superior to pasting two sheets of tinfoil on the opposite sides of the glass, as the condenser effect to a certain extent throws the tuning out of adjustment with the latter procedure.

In experimenting with this leaded glass idea, the Chicago fan found that an adjoining casement window could be utilized as a counterpoise with directional effect obtained by swinging the window in and out. The combination of leaded glass, lead-in and counterpoise is something that fans might experiment with to their advantage, preferably during the summer months, when the pneumonia germ is not so prevalent as in the winter.

Contributed by JOHN T. JONES.

In the February Wireless Age Watch For . . .

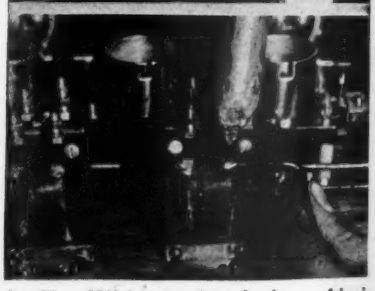
RADIO ENGINEERING, by John R. Meagher. The start of an experimental home-laboratory course in simple and advanced radio design. All easy stuff and lots of real dope.

THE WIRELESS AGE REFLEX. Complete constructional details of what is doubtless the best one-tube set yet developed.

DESIGN OF LOOP ANTENNA, by Ralph Batcher. Reliable data and information on how to design the most efficient loop for all types of receivers.

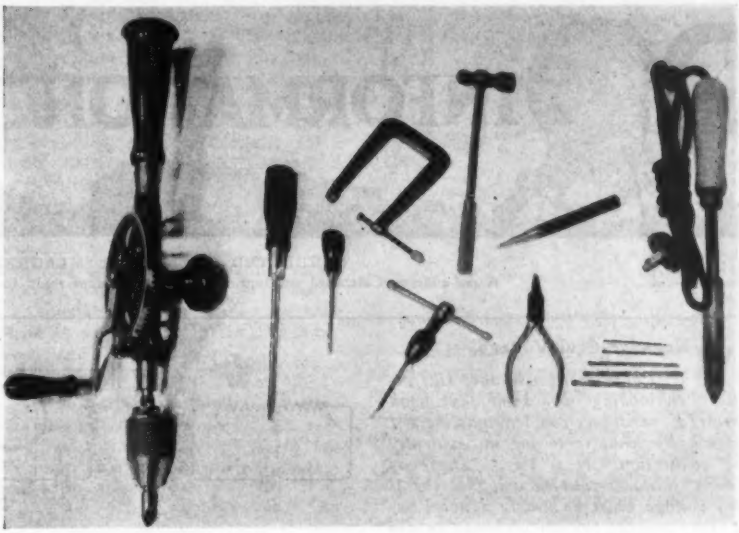
Soldering

ALTHOUGH soldering is one of the most important points in the construction of a set, many amateurs do not know how to do it properly. We should first make certain that the iron is hot enough; some fans do this by holding the iron a few inches from the face; if the heat can be felt, the iron is



O. K. With an electric iron this is not necessary as they very seldom become too hot but maintain a fairly constant temperature after the initial heating. The iron should be cleaned and tinned; similarly the joint to be soldered should also be cleaned and tinned. Only a small amount of solder need be flowed on the joint. Do not leave an irregularly shaped bunch of solder on the connection; that isn't a good joint. Use clean flux, as much as necessary to make the solder flow—but clean off the excess by rubbing vigorously with a clean cloth—make the joint shine. 50-50 bar solder, a good hot and clean iron and a good flux means success in soldering.

IN The Wireless Age Workshop there aren't any expensive or precision instruments. Only tools that nearly every amateur possesses are used in the construction of Wireless Age sets. The accompanying cut shows the entire outfit, costing about $7.00; if you want to equip a workshop to make a W. A. set, take this picture to the local hardware dealer and have him duplicate the parts.



A Crystal Receiver

Range: about 30 miles
Cost: from $5 to $10

A long distance regenerative receiver may be made with the parts used in the crystal set described on this page. Complete information on how to make the necessary changes will be published in the next issue of THE WIRELESS AGE.—*Look for it!*

A NAVY type loose coupler for a crystal set was the first piece of radio apparatus we ever constructed; it was a monstrous affair. The primary was about one foot long and six inches in diameter wound with miles and miles of fine enameled wire: the secondary was only slightly smaller.

Nearly a month was taken in its construction, but even aching fingers served not to dampen our expectations of wonderful results. For were we not going to hear Arlington time signals, Key West, Panama and even Nauen, Germany? Sure we were, but did we? I guess not! We had a hard time hearing our own New York naval station only twenty miles away! Oh, and what interminable hours we hung over that set—adjusting the coupling, the sliders, and the "cat whisker"—coaxing, cajoling, threatening—but to no avail.

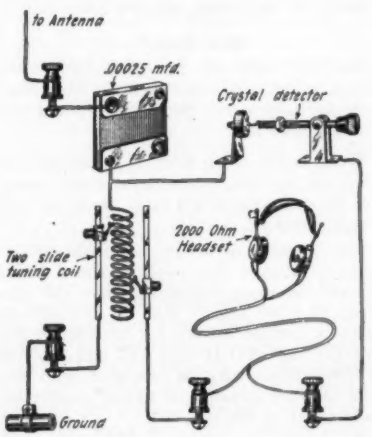
So it was little wonder that the thought crept upon us perhaps this "wonderfully-efficient-long-distance-navy-type-loose-coupler" wasn't all that it was cracked up to be!

So we junked it and made instead a single-slide tuning coil of bell wire wound on a ten-cent rolling pin form, and we had results with it that demonstrated the frightful inefficiency of that bulky loose coupler.

But even at that time, as at present, the single slide tuning coil was looked down upon as a sort of prehistoric and degraded relic. For in the best radio circles loose couplers were the thing for preventing interference and for long distance reception; according to those in the "B.R.C." single slide tuners were out of the question.

But that's the "bunk," because on our single slide tuner we heard more stations and with much greater volume than we had with the loose coupler.

And even with improved couplers we have never surpassed the results that we had with the single slide tuning coil.



MATERIAL

2,000-ohm headset.
1 Crystal detector stand.
4 Binding posts.
1 Winding form, 3"x6".
½ Lb. of number 20 bare copper wire.
2 Sliders.
2 Slider rods, 6" long.
1 Base 7"x10".
200 feet of number 14 aerial wire.

Therefore we would earnestly advise the beginner—the amateur who wants to start from the ground up—to build a good single or double slide crystal receiver rather that the ever so much more complicated loose coupled type.

A circuit hookup of a simple two-slide tuner is shown on this page.

The coil may be wound on a thin cardboard or bakelite form three inches in diameter and six inches long, with number 20 bare copper wire spaced with thin fishing cord. About 100 turns of wire can be wound in the five inches of available space.

The coil, fixed condenser, crystal stand and binding posts may be mounted on a board about 7" x 10" or they may be spread about on a table. Connections should be made with the No. 20 wire in exact accordance with the circuit diagram.

Tuning is very simple: The slider connected to the ground varies the wavelength of the antenna circuit; the other slider adjusts the secondary wavelength. Both sliders may be moved together for rough tuning or "pickup" work and final adjustments may be made with the secondary slider.

The antenna and ground are of much importance: The former may be a two-wire aerial between 100 and 200 feet in length and erected as high as possible above surrounding objects.

The range with a receiver of this type is of course dependent upon many variable factors, but reliable reception of broadcasting stations up to 30 miles may be expected. However, much greater distances have been covered and numerous reports of real DX work of 100 miles and more have been received.—J. R. M.

CONDUCTED BY JOHN R. MEAGHER

A self-addressed stamped envelope will insure a prompt reply to any queries on radio

Negative Grid Voltage

Mr. R. C. Panziger of Chicago, Ill., inquires: "In looking over some text book diagrams of resistance-coupled amplifiers I am struck by what is to me an evidently wrong connection. It is this: They say that in a resistance-coupled amplifier the B battery voltage must be nearly doubled because the coupling resistance reduces the voltage on the plate. This appears reasonable, but then they say that to make the grid negative by 3 volts a 3-volt C or grid battery should be inserted between the grid leak and the negative side of the filament.

"Now the grid leak has a resistance ten times are high as the plate resistance, so why shouldn't the grid battery be of a much higher value in view of the fact that there is so much resistance between it and the grid?"

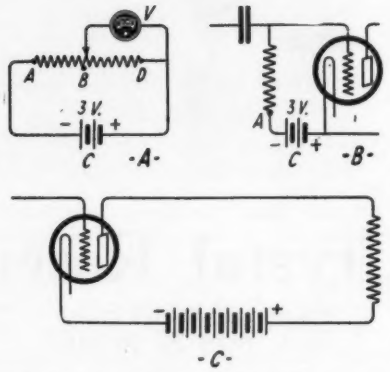
Gosh, Mr. Panziger, you almost found the text books to be wrong—didn't you? But fortunately, they aren't. The explanation may be given in a simple battery circuit.

Take (A) which shows a battery C of 3 volts connected across a resistance. If a voltmeter is connected from the slider to the positive side of the filament as shown and the slider is moved across to (A) the meter will read 3V. If the slider is moved to the midpoint (B) a reading of 1.5 volts will be secured. The percentage of resistance between (D) and the slider to the total resistance is the same as the voltmeter reading to the battery voltage.

Now suppose the slider is at a point near (A) where the value of resistance between the slider and the positive terminal is almost 100 per cent. of the total resistance; then the voltmeter will register almost 3V.

Look now at (B). Here our C battery is connected to a resistance comprising the grid leak and the grid-filament resistance. The latter has an infinitely high value (when the grid is negative) so the percentage of the resistance between the grid and filament to the total resistance (grid-filament resistance plus grid leak resistance) is nearly 100 per cent. Therefore there is a difference of practically 3 volts negative between the negative filament terminal and the grid.

The point which you overlooked and which accounts for your query is the difference in resistance values of the filament-grid path and the filament-plate path. The former is infinitely high (when the grid is negative with respect to the filament) while the latter is comparatively low.



Method of determining negative grid voltage

Best Tube?

Mr. C. Smith of San Francisco, California, asks for information about the "best" tube and which one we would recommend for all-round use.

There really is no tube to which we can point and say that it is superior to all others. But we can state which tubes we prefer for certain purposes.

For instance, as a detector if the proper battery voltages are applied, the UV-200 (C-300) is more "sensitive" than the majority of other types. But the UV-200 requires a storage battery for filament supply whereas the WD-11 and -12 and UV-199 (C-299) tubes may be operated with dry cells and are capable of giving results almost equal to the UV-200.

For radio frequency amplification with fixed semi-tuned (transformer-choke coil-resistance) inter tube coupling the UV-199 usually gives better results—not because it is a better tube, but because of the lower inter-electrodic capacity and consequent lower capacity across the terminals of the coupling device—making for a "broader" adjustment and corresponding amplification over the effective ranges. With tuned transformers or tuned impedance coupling a tube such as the UV-201-A will generally give better results than the UV-199. However, advantage may be taken of the low plate-grid capacity of the UV-199 in tuned transformer-coupled amplifiers by placing more turns on the primaries of the transformers; although the average, for short wave reception, is from 8 to 16 turns we have used about 50 with excellent results and with no difficulty in the control of self oscillation.

For audio frequency amplification we are heartily in favor of the UV-201-A (C-301-A) because it is a splendid amplifier; it is quiet; and it consumes so little filament current.

DX Regenerative Receiver

Mr. Charles J. Fitzgerald of Savannah, Ga., wants "—some dope on a really good long distance one-tube regenerative set for amateur and broadcast reception."

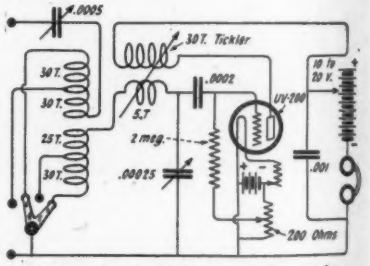
We are printing in these columns a circuit diagram of a very good one-tube regenerative receiver.

No. 28 or 30 double cotton covered wire may be used on all the coils and the winding forms should be very thin hard rubber or bakelite. The primary and all of the secondary, except 5 turns, are wound on a 3-inch tube about 6 inches in length; a space of 1.5" is left between the coils. The tickler of 30 turns and the five-turn grid coupling coil may be wound on a lightly constructed variocoupler form from which all other windings have been removed.

The variable condensers must be of the very highest quality and contact to the rotary plates should be through flexible leads. Verniers are not necessary, but if they are used they should be of the mechanical type.

The filament rheostat should be of the carbon compression type as the UV-200 tube requires a delicate filament adjustment for best results. The grid leak potentiometer is not absolutely necessary; if it is not used the grid leak should be connected to the positive side of the A battery.

The two-lever switch (shown in the diagram) affords a simple and quick method of switching from amateur to broadcasting wavelengths.

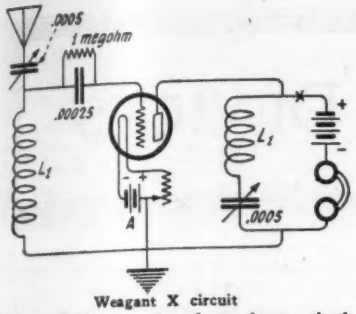


Hook-up for the DX regenerative receiver

Simple X Circuit

"Please publish a diagram and detail of a simple Weagant X circuit," writes Mr. O. T. Brown of Phoenix, Arizona.

The diagram on this page shows the proper connections for a Weagant X circuit receiver. If the filament rheostat is eliminated through use of a fixed resistance, an "Amperite" or the proper filament battery voltage, there will be but two controls; the antenna series condenser for tuning and the plate condenser for regeneration. If the Weagant circuit doesn't oscillate insert a radio frequency choke at the point marked X.



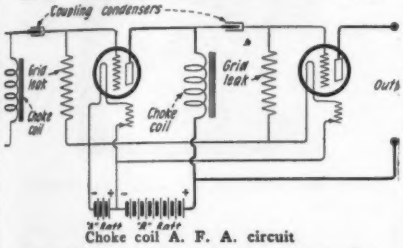
Weagant X circuit

The coils, L_1, may be of any form—single layer, honeycomb, spider web, curkoids, etc. Each should have an inductance of about 25 mh. Suitable coils may be wound on thin 3" forms with 50 turns of No. 30 double cotton covered wire. A small 7 x 10-inch panel will serve to hold the entire equipment.

Choke Coil A. F. A.

Mr. Ralph Elliott of Boston, Mass., writes for "a diagram of a choke coil audio frequency amplifier using two tubes."

A choke-coil a. f. amp. hook-up is shown on this page. The coupling condensers may be of 2 mfd. capacity and the grid leaks of about 2 megohms resistance. The chokes



Choke coil A. F. A. circuit

should have an impedance at speech frequencies equal or greater than the internal impedance of the tube. The secondaries of Ford spark coils have been used quite successfully.

Quality A. F. A.

Mr. R. Wittington of Astoria, L. I., is "—perplexed over the choice of an amplifier. I understand that the transformer-coupled type affords the most amplification per stage, but that considerable distortion is inherent in them. Would you kindly publish details of an amplifier that will give good undistorted amplification?"

A diagram of a "Distortion Free" amplifier is shown on this page. This system will give excellent reproduction and though the amplification per stage is not as great as in a transformer-coupled amplifier, still the quality is vastly superior. One disadvantage of this type is the necessity for a high plate battery voltage. However, if storage B batteries (as described in the December WIRELESS AGE by Mr. J. Brooks) are used this disadvantage will not be a severe drawback.

For further information about the design, construction and operation of resistance-coupled amplifiers we suggest that you read the article by Mr. Ringle in the December WIRELESS AGE.

B Battery Voltage

"What voltage B battery would you recommend for use with all types of amplifying tubes?" writes Mr. B. Slocum of Denver, Colorado.

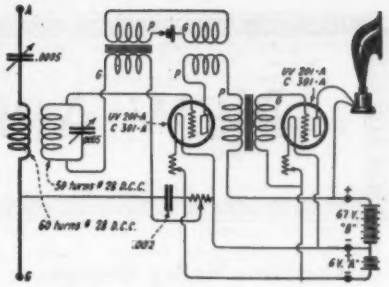
This is a question we settled with ourselves some time ago while using a six-tube receiver and dry cell B batteries with UV-201-A tubes. Usually we used 90 volts consisting of four 22.5-volt blocks. Experiments showed that there was no decided decrease in signal strength when only 67 volts were used. And as our detector plate was operated on 67 volts, we were able to eliminate one battery lead by making the plate voltage of all tubes 67. Furthermore, with this value of plate voltage there was no necessity for special grid batteries. And in addition, replacement of the three blocks is cheaper than four.

We always use separate blocks to make up the complete battery in order that if one cell goes dead, only one block will have to be discarded, whereas if one cell in a unit block of 67 volts is defective the whole battery might have to be "junked."

So we would suggest the use of three blocks of either storage or dry cells.

Reflex Amplifier

Mr. K. Merz of New York writes: "I have tried numerous two-tube reflex hookups but have had very little success with this system. It seems that my reflex receivers just won't percolate. I imagine it is the fault of the circuit, as I have followed them out exactly and have tested all the equipment. I would be most obliged if you will publish a good, reliable hookup for a reflex receiver that will operate a loud speaker with two tubes."



Circuit diagram for reflex amplifier

Surely; we are showing on this page a reliable circuit diagram for a one-tube reflex with an extra stage of audio frequency amplification. A crystal is used for rectification.

If good amplifying tubes, like the UV-201-A (C-301-A) are used with a plate battery of 60 to 90 volts you should obtain satisfactory loud speaker operation.

You can use the material you have or make up the set as follows:

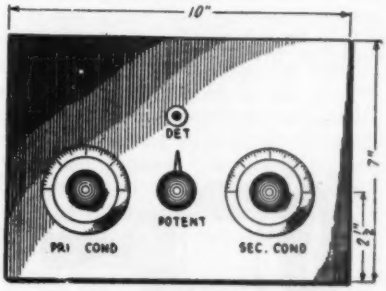
Fixed coupler—3" tube, 1/16" wall and 4" long. Primary, 60 turns of No. 28 or 30 D. C. C. wire. Secondary, 50 turns of No. 28 or 30 D. C. C. wire. Separation of ½" between coils.

Potentiometer—200 to 400 ohms with a .002 mfd. fixed condenser shunted across the slider and negative A battery terminals.

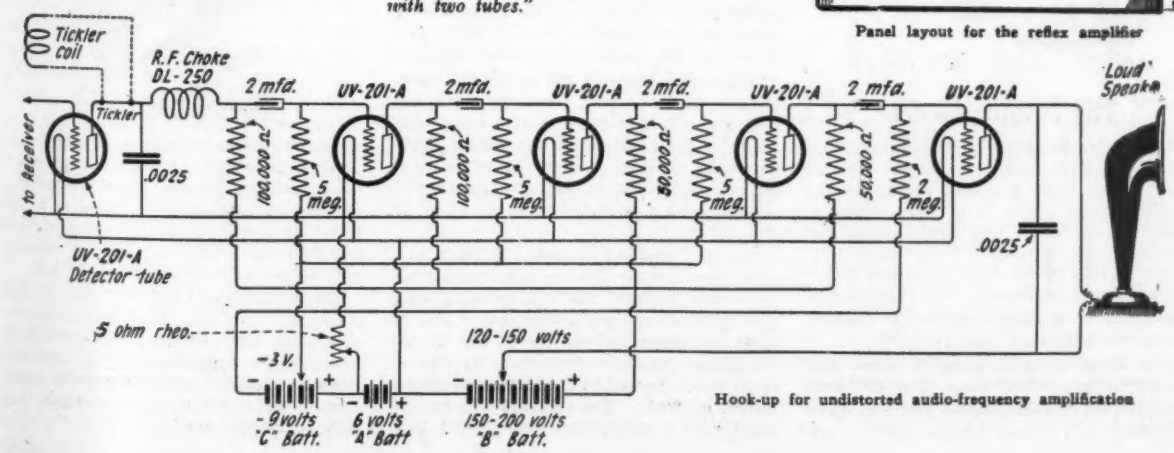
Audio frequency transformers—Both 4 to 1 ratio connected exactly as shown.

Filament controls may be 10-ohm rheostats or "amperites" of the proper type.

A standard 7" x 10" hard rubber or bakelite panel may be used if the parts are arranged as suggested in the layout sketch. The fixed coupler is mounted on the panel above the two variable condensers and the vacuum tubes, transformers, etc., are fastened to the wooden base.



Panel layout for the reflex amplifier



Hook-up for undistorted audio-frequency amplification

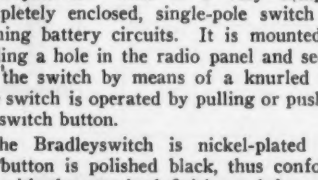
NEW APPLIANCES AND DEVICES

The New Valley Charger

THE Valley Electric Company of St. Louis is now in full production on the new Valley Type ABC Battery Charger, the improved model which the company has put out this year.

The type ABC charger has been designed to charge all radio batteries. It is built on the same principle as the other successful Valley rectifiers, but it is made for use on all types of radio storage batteries, including the 2-volt peanut tube batteries, 6-volt A batteries, and one two, three and four 24-volt B batteries. It has a tap for 12-volt batteries and may be used on 6- or 12-volt automobile batteries.

In order to make this new and complete radio battery charger harmonize with the home radio receiving set, the Valley Company has adopted a bakelite panel for the face of the charger with fittings and other parts in keeping with the use to which the instrument is to be put.



The Bradleyswitch

THE Allen-Bradley Co., Milwaukee, Wisconsin, have added a fourth item to their list of radio products, known as the Bradleyswitch. This is a very compact, completely enclosed, single-pole switch for opening battery circuits. It is mounted by drilling a hole in the radio panel and securing the switch by means of a knurled nut. The switch is operated by pulling or pushing the switch button.

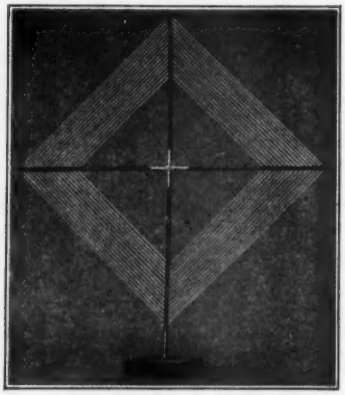
The Bradleyswitch is nickel-plated and the button is polished black, thus conforming with the standard finish used for radio equipment.

Hartman Loop

THE Hartman Loop Aerial is well adapted for use with standard sets. Using a .00025 mfd. variable condenser across the loop, the wave length range will approximate 200-550 meters.

The Hartman Loop is small but highly efficient and directional. A detachable wood base, with a 4-inch moulded dial is provided. All castings are made of aluminum.

The combination of carefully selected wood cross arms, and the arrangement of the windings equalizing the strain, minimizes the possibility of warping.



New Non-Inductance Potentiometer

RADIO fans who are using wire wound potentiometers and have had trouble with inductance in their receiving circuits will be interested in the new non-inductive potentiometer, shown in the accompanying illustration, which has been recently perfected by the Central Radio Laboratories.

The new instrument has a thin resistance element made of pure graphite and is not only non-inductive but also free from "skin effect." This feature of the design eliminates the choke-coil effect found in wire wound potentiometers and also insures the same resistance to radio frequency as to direct current.

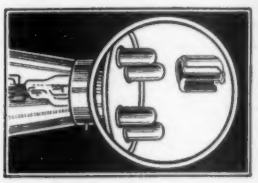
Smooth, noiseless operation is made possible by a circular disc of brass placed between the resistor and the pressure shoe and mounted in such a way that it can be made to engage the resistor at any one of the infinite number of points. As the resistor is not touched by the sliding shoe there can be no wear. The moulded base is provided with a transparent cover which protects the parts from dust and moisture and allows a clear view of the interior.

Type No. 110 has a resistance of 400 ohms which is the best value for accurate adjustment of plate potential and grid bias in vacuum tubes. A 2,000-ohm type, No. 111 is also made for special applications.

Radeco Safety Fuse

THIS device is a fuse which fits over one of the filament terminals of a vacuum tube and absolutely prevents "blowing out" from any excess current such as "B" battery, etc.

A fuse of this sort is a necessary article as we all know that many tubes are need-

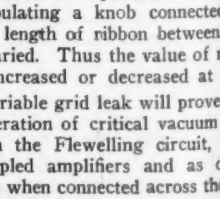


lessly destroyed by the accidental crossing of wires.

The fuse is attached in an instant and does not interfere with the efficiency of the set or the fitting of the tube in the socket.

Monroe Ribbon Grid Leak

A RATHER novel panel mounting variable grid leak has been developed by the Monroe Manufacturing Co. of Chicago.



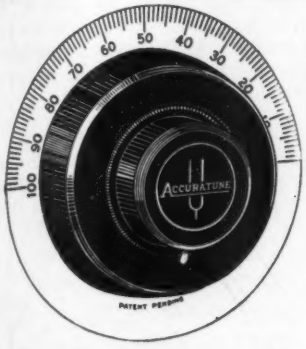
The resistance element is arranged on a flexible ribbon which passes through rollers —somewhat on the style of a clothes wringer. By manipulating a knob connected to one roller the length of ribbon between contacts may be varied. Thus the value of resistance may be increased or decreased at will.

This variable grid leak will prove of value in the operation of critical vacuum tube detectors, in the Flewelling circuit, in resistance coupled amplifiers and as distortion smoothers when connected across the secondaries of audio frequency transformers in an audio frequency amplifier.

The Accuratune

THE Accuratune is an actual micrometer control. For coarse adjustment the larger knob is used like any ordinary dial. The smaller knob operates the vernier mechanism for fine tuning. By rotating the dial from 0° to 100° by means of the vernier knob you can pick up station after station.

The Accuratune is made of genuine bakelite (highly polished, black or brown) with beautiful silvered dial and neatly engraved graduations. Fits either 3/16 or ¼-inch instrument shafts. Dial 4-inch diameter.



A Particular Plug for Particular Radio People

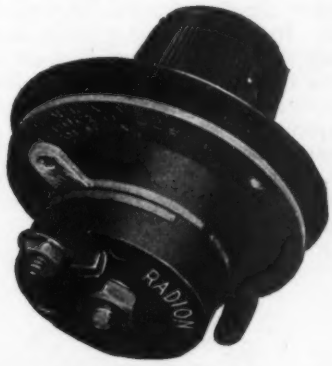
IN order to meet the requirements of that group of radio amateurs and radio broadcast listeners who insist on something better than the usual run of radio equipment, there has been developed a special plug which is shown in the accompanying illustration.

The Pacent 100 Duoplug accommodates two pairs of phones in parallel. No tools are required in making connections. The special type thumb nut connectors may be tightened with fingers, the nut being slotted so that with a dime or other thin coin a permanent, secure connection can be made. The special toggle structure of the connector screw, which is an exclusive Pacent feature, is important in that it permits two different sized cord tips to be connected at the same

time. The connectors also accommodate stranded or solid conductors, spade tips or practically any other type of terminal. Grooving on inside surface of connectors prevents connections from becoming loose. Bakelite insulation piece between the connections obviates any possibility of short circuiting and provides a means of attaching the cord. The engraving on this strip indicates the polarity of the connectors. The handle of the plug is of Bakelite, finely knurled, making for neat appearance and for a positive grip. Exposed metal parts are heavily nickeled. No live metal parts are exposed. No parts can become lost.

The Amsco Compensating Condenser

THIS unique device serves to eliminate the necessity of a potentiometer in radio frequency amplifying circuits, whether of the tuned, untuned or resistance coupled type. And because variation of its capacity is so readily accomplished the control is positive and effective.



The manufacturers of the Amsco condenser have used Radion insulation in the compensator in an endeavor to keep both the surface leakage and dielectric losses at a minimum.

State College Receives Gift of Radio Plant

THROUGH the efforts of Dean Goddard, the New Mexico College of Agriculture and Mechanic Arts is the recipient of the gift of a new radio station. This will include the equipment for constructing a 100-watt transmitter and the building to house it. The station will be utilized for experimental purposes and amateur relay work under the government license of 5XD. It will be separate and entirely distinct from the present radio house and its equipment, which will then be used solely for broadcasting service under its present call letters of KOB.

Plans for the new radio house call for a frame building 15x24 feet, with concrete floor. An operating room will occupy the east end of the building, while a club room for the College Radio Club will be at the west end. The center will contain a workshop and closets for the storage of miscellaneous equipment and batteries.

A site east of the Engineering Department's Forge Shop and south of the Commercial Building has been selected. This site gives plenty of open space about the building, where a new aerial of the T-cage type can be easily erected. It is planned to support the new aerial from two 60-foot A frame towers, spaced 125 feet apart. A counterpoise system of 20 wires is planned. These wires will radiate from the roof of the building in all directions to steel post supports at their outer ends.

The transmitter planned is of the reversed feed back type, using two 50-watt radiotron tubes for oscillators. The plate current will be supplied by a kenotron rectifier and filter system. The materials for this have already been purchased, and the set will be constructed by the Radio Club members from designs furnished by Dean Goddard.

When completed, this new station will give the College radio experimental facilities, which, combined with its present extensive equipment, will be unsurpassed by any college in the west, if by any in the United States. The work of the present station has gained a national reputation for the college in this branch of engineering. A number of students are now attending this institution because of the exceptional facilities offered along these lines. With the wide spread of interest in and use of radio as a means of communication, it is anticipated that the industry will require a large number of electrical engineers especially trained in this branch. Indeed, at the present time, the manufacturers of radio equipment cannot supply the demand, and much damage has resulted from the flooding of the market with cheap and worthless apparatus put out by incompetent and get-rich-quick dealers.

Radio Has Great Speed

IF you are 186 miles from a broadcasting station, when you listen in you hear each sound one thousandth of a second after it is produced in the broadcasting studio. This is because radio waves travel at the rate of 186,000 miles a second, so fast as to be instantaneous over all normal broadcasting ranges. If you were in a studio and with one ear heard a note struck on the piano, and at the other ear could hear the same note transmitted a thousand miles by radio, your ears would be unable to distinguish between the two. They would sound like a single note.

Speech Amplifier

(*Continued from page 56*)

here that the function that each of the switches A, B, C, D, E, performs is in the course of changing from phone to CW and ICW and will be explained in detail later.

Figure 2 is a schematic diagram of the oscillatory circuit used by the writer in connection with the speech amplifier just described, and since it worked so well I think I will describe it here although some of you may be already familiar with this type of circuit. In general, it is a closed oscillatory circuit coupled loosely to the antenna system, and the inherent advantage of this kind of a circuit is that the frequency of the emitted wave is dependent upon the constants of the closed oscillatory circuit and the change in capacity that the antenna undergoes when swinging in the wind will not change the frequency of the emitted wave; it will simply change the efficiency of transformation of energy from the closed oscillatory or tank circuit to the open oscillatory or antenna circuit as the antenna system swings in and out of tune with the tank circuit. There is of course only a slight capacity change during the swinging of an antenna so the relative drop in radiated energy due to this effect will be small. This type of circuit will radiate a constant frequency regardless of changes in the constants in the antenna system due to climatic conditions. There is one slight disadvantage to a circuit of this type because there is a slight loss of energy during the transfer from the tank circuit to the antenna circuit. Obviously it would be better if we could have a directly coupled type of circuit that would emit a constant frequency as we would be able to get more energy into the antenna. There is a circuit under development that will do just this very thing and later on I may write about this new circuit in detail.

The modulator and oscillator tubes used in this circuit are the same and may be either of the following type of tubes: UV-203, 50-watt tubes; UV-204, 250-watt tubes; UV-206, 1. KW. tubes. The speech amplifier will supply enough energy for the grid of the modulator tube no matter which of the foregoing tubes mentioned are used. In this case, due to the popularity of 50-watt tubes, the circuit has been adapted to the use of these tubes. In the case of the writer the UV-206, 1. KW. type of tube was used and the results were very gratifying.

Power Transformer

The power transformer in this case is the UP-1016 which is rated at 750 watts output and is capable of delivering the plate supply for the two UV-217 kenotrons and the filament supply for the kenotrons and the UV-203 radiotrons used in this circuit.

Rectifier

We will use two UV-217 kenotrons in this case for full wave rectification and will control their filaments by means of a PT-537 filament rheostat in series with the secondary winding that supplies these filaments. It will be necessary to connect this rheostat in the circuit with its resistance coils in parallel in order to handle the current for the two filaments. The A.C. supply to the plates of these tubes from the secondary winding of the power transformer is 1500 volts each and we can expect to get a rectified voltage of 66 per cent. of the A.C. or 1000 volts.

Filters

UC-490 filter condensers are used here instead of UC-488 as in the case of the speech amplifier because they will stand 1750 volts against 750 volts for the latter.

The 1000-cycle trap circuit in this case is made up of a UP-1654 filter reactor in parallel with a UC-1015, .0005 mfd. condenser. The inductance of the reactor is 50 henries or 50,000 milli-henries and therefore a UC-1015 condenser of .0005 mfd. capacity is necessary in parallel with it to tune to 300,000 meters (1000 cycles).

The radio frequency choke used here is a UL-1655 which has an inductance of 3 mh.

We now arrive at the modulator tube with a plate supply that is very nearly D.C.

Modulator

This tube is a UV-203, 50-watter, and its filament is supplied by the radiotron winding on the power transformer and is controlled by a PT-537 filament rheostat. The grid of this tube is supplied with excitation from the output of the speech amplifier—the point marked "to grid of modulator" on the diagram.

Oscillator

Another UV-203, 50-watter is used here as an oscillator and is connected to the plate supply through the 6 mh. choke composed of two UL-1655 radio frequency chokes in series.

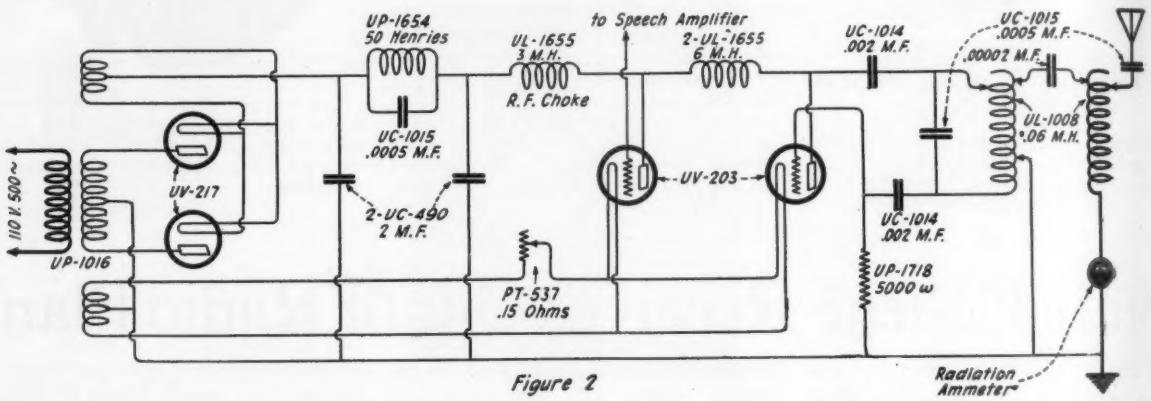


Figure 2

This diagram represents the hook-up of the oscillator

The filament is connected to the same winding of the power transformer and controlled by the same rheostat as the modulator tube.

Oscillatory Circuit

The constants of this circuit depend upon the wave length it is desired to radiate and assuming an amateur wave length around 200 meters, the constants of the circuit would be as follows: The tank inductance should be a UL-1008 oscillation transformer which has an inductance of .06 mh. and the capacity shunted across this coil should be a UC-1015 which has taps for three different capacities, namely, .0003, .0004, .0005 mfd. The plate is connected to this coil through a UC-1014, .002 mfd. blocking condenser. The grid is connected to the other end of this coil through another UC-1014, .002 mfd. blocking condenser. The grid is also connected to ground through a UP-1718, 5000-ohm grid leak. The ground tap is connected on the coil at a point about 1/3

(*Continued on page 74*)

"THE AIR IS FULL OF THINGS YOU SHOULDN'T MISS"

Radio has moved from the laboratory and amateur's work-table out into the refined surroundings of the family living room. In keeping with this new companionship we offer this reliable, long-lived Eveready "B" Battery, in an attractive, new metal case, worthy to stand beside the rich cabinets of fine radio sets.

Eveready "B", 22½ volts, No. 766 with Six Fahnestock Spring Clip Connectors.

When Radio called, Eveready was ready

TWENTY-ONE years ago, when wireless telegraphy had its first birthday, National Carbon Company's dry cell batteries were nine years old. Even then its batteries were world famous as convenient, economical and efficient sources of electric energy.

With the introduction of broadcasting, radio leaped into universal service. Radio engineers used Eveready Batteries as their standard in designing tubes and receiving sets. Eveready engineers, backed by the most complete research and testing laboratories known to the industry, worked with them to discover how the known dry cell could be improved for radio work.

The fruit of these efforts is the Eveready family of radio batteries, conspicuous for vitality and endurance—the right battery by test and proof for every radio use.

To be certain of battery satisfaction, insist on Eveready Radio Batteries—they last longer. All reliable radio dealers sell them.

Informative and money-saving booklets on Radio Batteries sent free on request.

NATIONAL CARBON COMPANY, INC., New York, N. Y.

Headquarters for Radio Battery Information

If you have any battery problem, write to RADIO DIVISION, NATIONAL CARBON COMPANY, INC. 198 Orton Street, Long Island City, N. Y.

Eveready 6-volt Storage Battery

Eveready Radio "A" Dry Cell
Specially manufactured for use with low amperage tubes

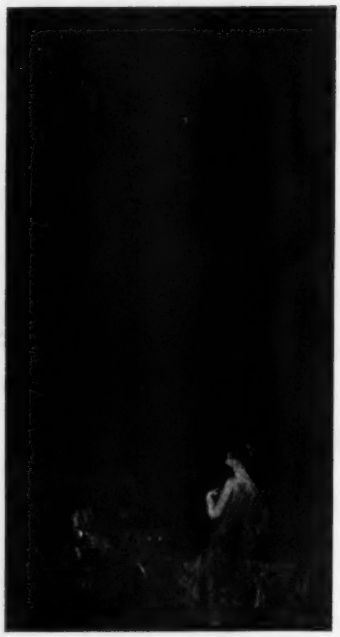
No. 764
The Space Saver
Vertical
22½-volt
"B" Battery

No. 767
"B" Battery, 45 volts
Variable taps
Fahnestock Clips

Eveready Three
or "C" Battery
Clarifies tone and increases "B" Battery life

EVEREADY
Radio Batteries
—they last longer

INDUSTRIAL INKLINGS



THE National Carbon Co., in promoting the idea of radio in the home, employs a happy combination in their advertising—romance and art.

Home and family brought into contact with the heart of the world through radio has a romantic touch in, "The air is full of things you shouldn't miss."

Linking radio and fireside with the cosmos has been admirably accomplished by the artist in his composition. The result should be suggestive to other advertisers.

THE Burgess Battery Co., Madison, Wis., publishes a pamphlet containing an index of broadcasting stations, forms on which the stations heard may be recorded, maps illustrating the standard time divisions, a chart of comparative times in the principal cities, besides some general information on dry cell batteries in radio.

A COMBINATION catalogue and instruction booklet is published by Herbert H. Frost, Inc., Chicago, Ill. It contains several unique features desirable to radio fans.

THE Atlantic Radio Co., Boston, Mass., designed a novel window display for stimulating holiday sales, pushing the slogan, "Give him a new set of tubes for Christmas."

A large cone, supporting successive types, illustrated the progress made in the development of vacuum tubes.

MR. HAYNES of Haynes-Griffin Radio Service Inc., New York City, has introduced a feature that marks another milestone in gaining public confidence.

Every afternoon at 4:30 he gives an informal talk in the store on Super-Heterodyne circuits, and other current topics, to all who wish to attend. Questions from the audience are encouraged.

W. B. JOYCE, chairman of the National Surety Company, has acquired a substantial interest in the Dubilier Condenser & Radio Corporation and has been elected a member of the board of directors.

THE Willard Storage Battery Company has a monthly publication, "The Connector," issued in the interests of a still better Willard Service Organization.

Their November number has some lively window display stimulators.

BURT'S SUPPLY AGENCY, Atlantic City, N. J., went out after the business on an "installation service" basis. A truck carrying a ladder is featured in Mr. Burt's advertising with the slogan, "This is the truck that will install your Christmas Radiolas free of charge."

THE Radio Bible Service Bureau, Cincinnati, Ohio, is organized to give the world daily, "a message from the Word of God by radio broadcasting."

THE appointment of E. W. Martin as Chicago District Manager has just been announced by the Valley Electric Company, St. Louis, manufacturers of Valley Radio Battery Chargers and other electrical products.

Mr. Martin comes to the Valley organization from the Westinghouse Electric and Manufacturing Company with which he has been associated for a number of years in various capacities.

The appointment of C. L. Krentz in the sales department of the Chicago Office is also announced by the Valley Electric Company.

To the Philadelphia Show by Airplane

MR. C. D. TUSKA, president of the C. D. Tuska Company, received a telephone S O S from his Philadelphia representative, Mr. L. B. Underwood, that the Superdynes had not arrived for the radio show which opened that day, November 13. Mr. P. K. Spencer, factory manager, loaded several in his private airplane and with Mr. Tuska reached Philadelphia by noon, a flight of less than two hours.

New Magnavox Catalogue for the Radio User

THERE has just been published by the Magnavox Company a very useful and attractive catalogue for the information of radio users.

In addition to very adequate illustrations and descriptions of the Magnavox Radio line, there is also an entire section devoted to correct hookups and general information, which even the very experienced radio enthusiast will find helpful.

There are also pages devoted to illustrating and explaining the fundamental principle involved in the Magnavox electro-dynamic and also the Magnavox semi-dynamic types of reproducer, the latter type having been evolved in order to meet the requirements of dry battery receiving sets.

Copies of this Magnavox radio catalogue will be sent on request by the Magnavox Company, Oakland, Calif., or 370 Seventh Avenue, New York City; and are also obtainable from radio dealers who handle the Magnavox line.

Pushing Small Parts

IN one of the best radio trade catalogues we have yet seen, the H. H. Eby Manufacturing Company "tell the world" about the famous Eby binding posts.

The first text page contains six points of business policy worked out in a most clever and sincere manner. We wish every manufacturer and dealer would cut out that page, hang it over his desk and believe in it.

After this bit of super-salesmanship the different types of Eby binding posts, each with its distinguishing name, are described in detail; splendid photographs helping the reader to appreciate the numerous mechanical and electrical features of superiority. Then, having told why Eby posts are good, they back it up with a two-page half-tone which speaks for itself insofar as it pictures almost 57 varieties of manufactured radio receivers and instruments using Eby posts. Nothing could be more convincing!

The end of the catalogue is devoted to subjects most dear to the dealer's heart—national advertising to make Eby post move fast and attractive, snappy counter display to catch the eye and spare cash of the customer.

To really appreciate the 15th catalogue of the Eby Manufacturing Co., one has only to read it. We would like to see more of its kind.

America Exports Sets to 41 Countries

AMERICAN manufacturers of radio apparatus are leading the world in exports, the past eight months' total being valued at $2,200,000, according to Department of Commerce figures. In August, Argentina led other countries in the purchase of American-made radio equipment; our exports going there amounted to $99,059. Uruguay stood second with $40,984 worth of apparatus, while Canada imported $27,648 worth of American equipment. The total American exports in August amounted to $307,127, going to 41 countries.

New 1924 Model

Pathé

LOUD SPEAKER

Mahogany Finish

PRICE Now $17.50

(West of Mississippi $19.00)

See It Today

Step in your dealer's store—he will gladly give you a demonstration without obligation. See this wonderful new value, placed on the market now for the first time. You will realize the outstanding superiority of the new Pathé Loud Speaker. Notice its beautiful Mahogany finish and its ability to reproduce long distance signals clearly. With the new low price it is the best buy on the market.

Free Pamphlets

Write now for free pamphlets on the Pathé Loud Speaker, Pathé Variometer, Pathé Variocoupler, Pathé Dials and the new Curtantenna.

Jobbers and dealers write for new special Proposition.

Pathé Phonograph & Radio Corp.

20 GRAND AVENUE BROOKLYN, N. Y.

Western Sales Office, 533 Wabash Ave. Chicago, Ill.

Face of Panel Mounting

Showing Contacts

Rainbow Multi-Plug and (8 ft.) Cable

Either panel or binding post mounting.
Does away with unsightly wires.
Leaves set free from live wires when not in use.
Several binding post ends can be connected to different sets—using one plug and cable connected to batteries, etc.
Ideal for dealers—and experimenters.
Prices Multi-Plug & Cable Panel Mounting type, $4.00. Binding Post type, complete, $5.00.

Write for illustrated folder of Howard B. Jones Radio Products.

HOWARD B. JONES, 612 S. Canal Street, Chicago, Ill.

SOLID COMFORT
Comes With The Use Of The

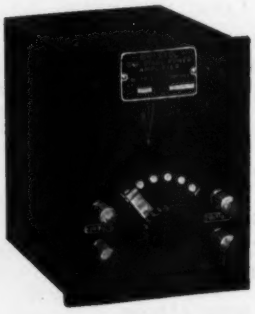
TRADE MARK
AUDIOPHONE
REG. U. S. PAT. OFFICE

because nothing is lost from the original broadcasting.

Not only is it easily possible to distinguish the words of the speaker, but also the minute graduations in pitch, timbre and quality of overtones which distinguish individual voices.

The Audiophone is complete and self-contained—needs no separate battery or other accessories—goes to you ready for use on connecting to your receiving set. It will prove a source of lasting pride and pleasure.

Audiophone Sr. .....Price $32.50
Audiophone Jr. .....Price $22.50



Bristol One Stage Power Amplifier

If greater volume is desired, over what you already obtain, use the Bristol One Stage Power Amplifier. No C Battery required.

Price $25.00

THE BRISTOL COMPANY
Waterbury, Conn.

Please send me without cost or obligation to myself, Bulletins Nos. 3006 and 3011-V on Bristol Audiophone and One Stage Power Amplifier.

Name .....
Street and No. .....
City.....State.....

The Personality of a Broadcasting Station

(*Continued from page 38*)

a long time now, almost every night. An infinite variety of entertainment has come over the "radio" and many evenings I have stayed home to listen to the program.

My distant station has never failed me. At the touch of the switch, it was there, and I enjoyed the music provided for the evening. But in the year and a half that I have been listening in, how many times have I complimented the station, how many times have I told of my appreciation for the work of the invisible, but real artists? Well, I remember writing once, a short letter relating the joy which followed the reception of a fine concert, one lonely evening last winter. Only once?

Surely I must have told the station how much I liked the quartet selections which I heard in the early part of the year, and the instrumental music which pleased me particularly some time later on in the season. Did I forget to write the humorist who gave me a full evening's entertainment only last May? Of course, I am not speaking for little Johnny, who could say a lot for the bedtimes tales, nor for Jane, who is quite grown up, and who likes the dance music. But I do feel a sense of guilt, and I am anxious to right myself with the station, whose daily programs have relieved me from much of the day's weariness.

So, as soon as I have finished this, I will begin a real letter of thanks to my favorite station. Perhaps my favorite station is yours also. It will appreciate a word from all of us.

The Navy's Radio Net

(*Continued from page 33*)

accurate astronomical observations are impossible. The ship sends a radio call to one or more of the navy stations, the request is relayed to the compass station, and the position of the vessel within one-tenth of a degree is immediately dispatched to the ship.

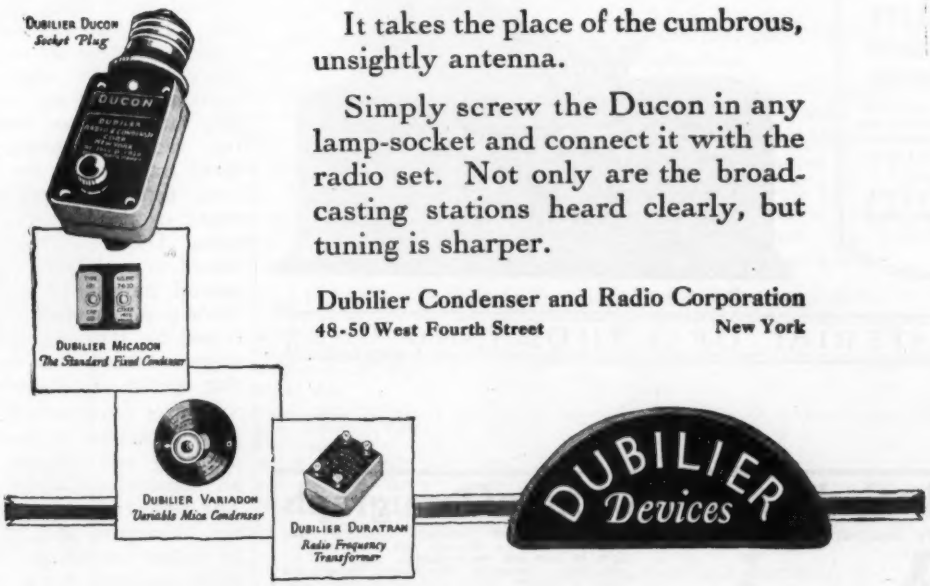
More than 5,000 bearings a month are furnished to merchant ships by the department's compass stations, the system last year being the means of preventing fifteen merchant vessels from going aground. The great trans-Atlantic liners invariably use the service when approaching port in inclement weather. The radio beacon, a more recent development, whereby the radio compass is on board the ship, enables mariners to determine their own position by radio, and to steer a straight course to safe anchorage. The compass service is of particular value in so-called fogbound ports such as New York, where preventing de-

So practical—so convenient

The Dubilier Ducon is the standard socket-plug.

It takes the place of the cumbrous, unsightly antenna.

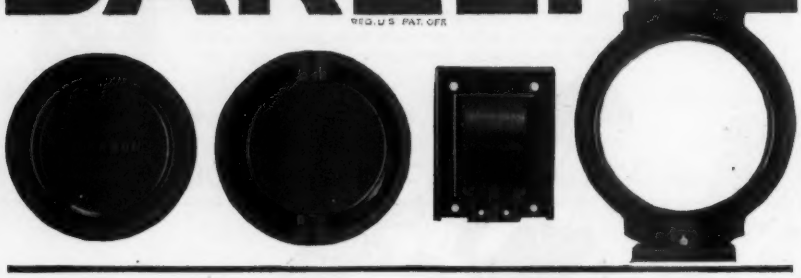
Simply screw the Ducon in any lamp-socket and connect it with the radio set. Not only are the broadcasting stations heard clearly, but tuning is sharper.



Dubilier Condenser and Radio Corporation
48-50 West Fourth Street **New York**

BAKELITE

REG. U.S. PAT. OFF.



Paragon *and* Bakelite

The pleasure and satisfaction that the Paragon Receiver brings to the family circle is appreciably increased through the use of Bakelite.

Bakelite possesses a combination of properties not found in other materials, which makes it peculiarly suitable for this service. Its excellent electric properties provide complete insulation that remains unimpaired under all atmospheric conditions.

Because of its high temperature resistance and non-absorbent properties, Bakelite performs equally well in all climates.

Its great mechanical strength, permanent beauty of finish and color enhances the value of any Radio Equipment in which it is used.

The Adams-Morgan Company chose Bakelite because of these desirable qualities and, for the same reason, leading Radio Manufacturers have adopted Bakelite as standard insulation for the manufacture of parts and complete units.

Send us your name and address and we will mail you a copy of our Radio Booklet A.

BAKELITE CORPORATION
247 Park Avenue, New York, N. Y.
Chicago Office: 636 West 22nd Street

BAKELITE
Condensite
REDMANOL
are the registered Trade Marks for the Phenol Resin Products manufactured under patents owned by
BAKELITE CORPORATION

THE MATERIAL OF A THOUSAND USES

Learn the Code at Home with the Omnigraph

"Just Listen—The Omnigraph will do the teaching"

THE OMNIGRAPH Automatic Transmitter will teach you both the Wireless and Morse Codes—right in your own home—quickly, easily and inexpensively. Connected with Buzzer, Buzzer and Phone or Sounder, it will send you unlimited messages, at any speed, from 5 to 50 words a minute. **THE OMNIGRAPH** is not an experiment. For more than 15 years it has been sold all over the world with a money back guarantee. **THE OMNIGRAPH** is used by several Depts. of the U. S. Govt.—in fact, the Dept. of Commerce uses **THE OMNIGRAPH** to test all applicants applying for a Radio license. **THE OMNIGRAPH** has been successfully adopted by the leading Universities, Colleges and Radio Schools.

Send for FREE Catalog describing three models, $14 to $30. DO IT TODAY.

THE OMNIGRAPH MFG. CO.
16B Hudson St. New York City

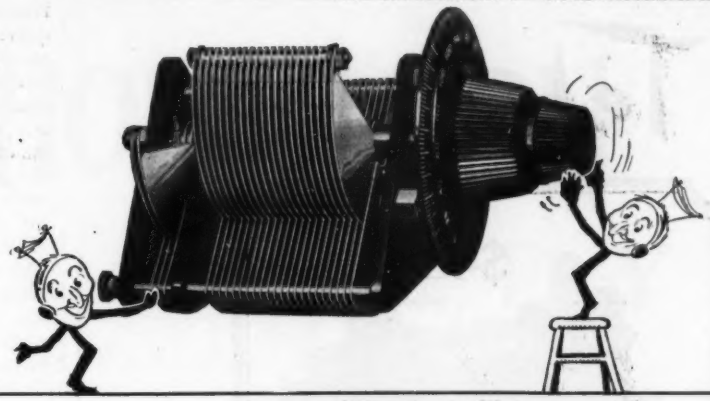
If you own a Radio Phone set and don't know the Code—you are missing most of the fun

lays in landing cargoes means in the course of a year millions of dollars to American commercial interests.

The Federal Poulsen arc, varying in sizes from 100 to 500 KW., is the type of transmitter in general use by the high power navy stations. Originally all stations used spark transmitters, but the continuous wave in the form of an arc was later standardized. With the development of the radiophone the navy was urged to replace the arc sets with alternators on account of the objectionable "mush," harmonics and compensation wave inherent with all arc transmitters, but subsequent experiments to overcome interference proved successful and it is expected that the arc will resume its position as a satisfactory single wave continuous wave transmitter. For low power stations the spark set is expected eventually to be replaced by the continuous wave or interrupted continuous wave, inasmuch as the spark uses too wide a band. The navy has developed an attachment to spark sets in which tubes can be used to give a satisfactory wave, thereby making it possible to remove the spark interference at much less cost than if complete new tube transmitters were installed.

Important contributions to radio art have come out of the navy's radio research laboratories. Much of this work is done in co-operation with the Bureau of Standards and with commercial radio equipment manufacturers. The list of achievements includes, in general, improvements in spark and C.W. transmitters, development of steel and telescope antennas, vacuum tubes, receiving apparatus, radio mechanical relays, high speed transmitting and recording systems, depth sounding and submarine sound signal devices, and aviation radio. Duplex operation has been installed in each navy district whereby several transmitters are used in the sending station and messages are received by remote control. The Arlington station has six transmitters that operate simultaneously.

Central headquarters for the complete system are at Washington where incoming and outgoing messages for all stations are coded and decoded. The central office operates the Arlington, Annapolis and Sayville stations by distant control, the business for all other stations being handled from Washington either by leased land lines or radio relays. Based on commercial rates the system handled for the navy last year nearly $3,000,000 worth of business, and for other departments including the Department of Agriculture, Commerce and State over $1,000,000. Receipts from commercial work were approximately $300,000.



"Some Condenser" says the "Radio Bug"

Makes your receiving set respond to every broadcasting station operating.

The size of the Kellogg Condenser and dial gives easy, accurate tuning. The vernier makes unusually sharp tuning a simple matter.

The end plates are of the best radio insulation in use today—Bakelite. The Kellogg accurately built dial is also of Bakelite, which retains its handsome appearance indefinitely. Its heavy reinforced construction and beauty of design add to the appearance of any set.

The rotor plates are properly spaced and bolted together, making it impossible for them to make contact with the stator plates.

Large bearing surfaces assure smooth, even rotation of the rotor plates and reduce wear to a minimum.

The high class workmanship, with the fine materials used in Kellogg Variable Condensers place them in a class by themselves.

The relations of the capacities is such that as great a flexibility as desired in any set may be maintained by the use of the various models.

The resistance to alternating currents at the average wave length is low thus assuring full use of all current intercepted by the antenna.

The Kellogg variable condenser is a precision instrument built in size, proportion and ratio for use as a decremeter or wave meter, as well as for control of capacity in the radio broadcasting and receiving sets. This makes it of far greater value to the amateur as well as the laboratory expert.

Kellogg Variable Condensers are made in the following styles:

Code No.	Zero Cap.	Max. Cap.	Ratio	Price
601-11 plate Vernier	.000120	.000262	2.1:1	
with vernier All Plates	.000120	.000600	5 :1	$6.75
602-11 plate	.000045	.000396	2.8:1	4.50
603-23 plate Vernier	.000071	.000210	3 :1	
with vernier All Plates	.000071	.000990	14 :1	7.75
604-23 plate	.000071	.000885	12.6:1	5.50
605-43 plate Vernier	.000102	.000250	2.4:1	
with vernier All Plates	.000102	.001800	17.6:1	8.75
606-43 plate	.000082	.001690	20.7:1	6.50

Have your dealer furnish you with Kellogg radio equipment and know you have the best.

All Kellogg Radio Parts are manufactured and guaranteed by

Kellogg Switchboard & Supply Company

CHICAGO, ILLINOIS

COLUMBUS, OHIO KANSAS CITY, MO. SAN FRANCISCO, CAL. PORTLAND, ORE.

Kellogg Apparatus exclusively is used in building the Symphony Receiver

Teleradio

Continuous Satisfaction

FILAMENT RHEOSTAT

Is reversible and can be mounted on either panel or base. Double brass bearing on spindle insures smooth action and prevents looseness. Contact arm is phosphor bronze. Will carry 1¼ amperes without heating.

Price (6 or 30 ohm), $1

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His joy in finding accuracy and dependability in this instrument reflects the efforts of the manufacturer to fully please the owners of Teleradio products.

With extra heavy polished hard aluminum plates that will not warp, a special locking feature preventing short circuiting of vernier and providing permanent and perfect contact, an accurate and constant capacity, and with rigid construction throughout, there is positive assurance of continuous satisfaction from this precision instrument.

Guaranteed electrically and mechanically.

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TELEGRAPH INSTRUMENTS

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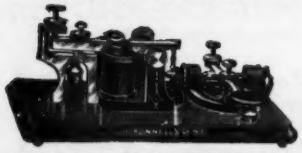

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According to Commander S. C. Hooper of the Washington Headquarters, "radio changes the fleet from an unwieldy mass of ships, scouts and aircraft to a perfectly controlled combination of units, each fully informed and directed in order to perform its function at maximum efficiency and at the proper instant. The radio system failing, the value of information and the effective execution of plans of the Commander-in-Chief are destroyed. The apparatus, though complicated, must never fail. It must be compact for easy manipulation, selective for working through interference and of unvarying wave length so that communications will not interfere with one another. No expense must be spared in providing necessary facilities."

Radio Frequency Amplification

(*Continued from page* 54)

signal strength is the ideal condition of tuning which should be striven for, but at the same time if we do so adjust the receiver as to throw it into oscillating condition the results will not be as serious in the production of external interference as it would be if we did not use any radio frequency amplification.

It must be remembered that the one who is using this receiver, or in fact, any receiver that is made, should not be disappointed if the receiver does not give its best results the first time it is used, because it may not necessarily be the fault of the receiver, and in fact, it very seldom is the receiver's fault. The first thing that the broadcast listener seems to think after he sits down at his receiver and it fails to function in what he considers to be a proper manner is that there is some trouble with the receiver. With a home-made affair it is quite posible that the trouble is in the receiver, but with an outfit constructed by a reliable manufacturer this is very seldom the case. The usual trouble lies in the lack of knowledge of the proper manner in which to operate the receiver. For example, let us look at some parallel cases in other mechanical lines. How does an autoist learn to successfully operate his automobile? It most certainly is not by merely learning how to shift gears and how to operate the self-starter. It is only after months of experience with his automobile that he is immediately able to tell what is the trouble if there is some slight sound coming from its interior which he has never heard before. In other words it is experience which enables him to run his car with any degree of success. How is it that the railway engineer

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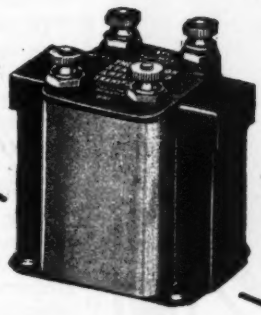

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The Zenith Radio Corporation, manufacturers of LONG DISTANCE RADIO RECEIVERS, famous for the Berengaria record and their accomplishments on the S. S. Bowdoin at the North Pole, also have adopted Thordarson super-transformers as standard equipment.

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TRANSFORMERS FOR EVERY PURPOSE

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NO LOOPS NO ANTENNA

The RADIODYNE is operated by simply grounding to a water pipe or radiator, and throwing a few feet of wire on the floor. No outside antenna, or loop is necessary. Uses any standard tubes—dry cell or storage battery. Extremely selective. Simple to operate—only two controls.

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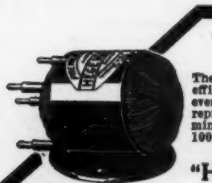

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upon hearing some uncommon sound coming from the interior of the very complicated mechanism which he controls is immediately able to judge as to the seat of the trouble and remedy it before disaster results? Experience is the answer. Therefore if your receiver does not operate satisfactorily the first time you work it bear in mind that it is probably owing to some fault of your own, and that there is nothing wrong with the receiver for it was designed by a man who knew his business and that in addition it was not the first receiver which that particular company constructed. Therefore if trouble is experienced have a little patience and remember, "It is a poor workman who blames his tools," as an old and very true saying has it.

In the final series of tests a regenerative receiver was used using the so-called Reinartz adaptation which had been constructed by two students at the Radio Institute of America. The set-up for this test is shown in figure 9. Figure 10 gives the diagram of connections of this set which was included because it has been stated so many times and in so many places that it was impossible to use this circuit with radio frequency amplification. It was considerably worth while to explode that bubble once for all by giving the circuit and photographs of the set-up as actually used. In this circuit as well as with all of the other circuits which were made use of in these tests it was found possible to have excellent control of the regeneration by the operation of the usual regenerative controls of the receivers and that the various tuning elements functioned as well when used with the radio frequency units as without it.

Speech Amplifier

(*Continued from page 64*)

the distance between the grid and the plate end and when the set is in operation the exact point for this ground tap can be found by adjusting it to give minimum plate current with maximum oscillatory current. This circuit is coupled, very loosely, from the high potential side to the high side of the UL-1008, .06 mh. antenna coil. The capacity of this coupling condenser should be approximately .00002 mfd. and can be made of two copper discs about 12 inches in diameter supported on adjustable insulated stands so that they can be moved closer together or farther apart to increase or decrease the capacity to get the proper amount of coupling.

ANTENNA CIRCUIT

The antenna is connected to the antenna coil through a UC-1015, .0005

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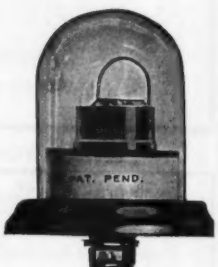

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mfd. condenser and the ground is connected to the other end of the coil through a 0-10-ampere radio frequency ammeter.

Now the circuit is complete, and with the oscillatory adjusted to give maximum radiation and highest efficiency we can apply the speech amplifier and note how it functions.

FUNCTIONING OF THE CIRCUIT FOR PHONE WORK

Now we come to the question of the switches A, B, C, D and E. For phone work we have the following conditions as shown by the chart in figure 1: A closed; B open; C closed; D open; E closed.

This also seems to be the proper time to explain how the bias on the UV-203 modulator tube is adjusted by means of the 5000-ohm potentiometer. We already have good quality speech coming from the output of the speech amplifier and in order to put this good quality on the air it is necessary to have the modulator grid biased by the proper amount. If there is a D.C. potential of 300 volts on the plate of the speech amplifier then, since the potentiometer is directly across the D.C. supply, point x is negative and point y is at plus 300 volts. Now, since E is closed to ground as well as the filament of the modulator, these two points being at the same potential, electrically they are the same, so we will consider point E the modulator filament. Also, since point x is connected to the modulator grid we can call it the grip point. Therefore, if we had the pointer of the potentiometer E at point x, E and x would be at the same potential, thus, the filament and the grid of the modulator would be at the same potential. Now if we moved the pointer E toward y to a point at plus 10 volts, for instance, we would have the ground or filament at a point 10 volts higher than the grid; or saying the same thing in other words, we would have brought the grid to 10 volts negative with respect to the filament. We have biased the grid 10 volts and we could continue to still further bias the grid until we got it at a point 300 volts below the filament, but this would be unnecessary because the tube would have blocked with a negative bias far less than this. The beauty of this circuit is that we can adjust the negative bias of the modulator while the circuit is in operation and can consequently get the quality down to the finest point possible. It would be simply necessary to connect a pair of telephone receivers to a wavemeter or receiving set with the antenna disconnected—using the primary coil for a pick-up—and after tuning in the speech we could adjust

"It's real fun to tune-in now— since Jim equipped our set with

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MICROMETER CONTROLS

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"You must not confuse the Accuratune with any of those so-called vernier attachments or 'mere dials.' It's a real control ten times as accurate as any vernier and far more simple to operate. Just by the slightest turn of the micrometer knob I can easily get station after station, clear and distinct, in half the time Jim formerly took.

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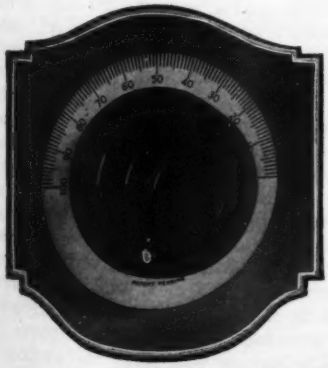

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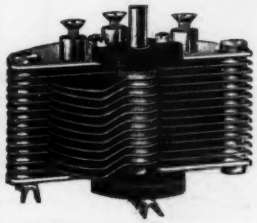

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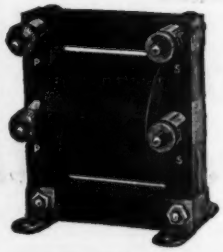

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the modulator bias until the quality of the speech was best.

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For I.C.W. we have A open, which cuts out our smoothing condensers; B closed, which short circuits our 1000-cycle trap; C open, which cuts out one kenotron and thus gives half-wave rectification or a 500-cycle ripple; D open and E closed which gives us our proper modulator bias for good modulation. Now, with our filter condensers and our trap circuit cut out and one kenotron out of the circuit, the 500-cycle ripple goes through to the grid of the modulator and the high frequency current being radiated is modulated by this 500-cycle note, which is a very pretty note.

C.W. Operation

For C.W. transmission all the switches are back to the position they had in phone transmission except D and E. D is closed and E is open, which throws the grid of the modulator 300 volts negative, so far negative in fact that it blocks and refuses to function, the result being that a pure unmodulated C.W. note is radiated.

All of this switching in the speech amplifier circuit can be taken care of by means of a single gang switch with five elements. An element for each one of the switches, there being three positions of this gang switch, namely, phone, C.W. and I.C.W. The use of the gang switch for the speech amplifier unit was the method employed by the writer.

DX Reception in the Grand Canyon

(*Continued from page* 18)

Little Colorado, and 225 miles below the starting point of the expedition, at Lees Ferry. Here they were met with supplies and mail and with newspapers containing wild accounts of possible disaster to the party in the big flood. One of the accounts stated that an overturned boat marked "U. S. G. S." had been seen below Boulder Canyon, and it is true that one of the Survey's boats at Bright Angel, used in hydrographic work, broke loose and was carried away, but the description of the boat seen does not tally with this boat, so perhaps the boat seen was one of those of the U. S. Reclamation Service, marked "U. S. R. S." Here the boats were overhauled, reports were prepared, the equipment was examined, and the radio outfit repaired and set up, where it received messages from Los Angeles and elsewhere, among them the broadcast telegrams announcing the safety of the party.

The voyage was resumed October 7, when the boats plunged into Diamond Creek Rapids. A couple of the boats

Why do you do it?

O' HELLO LIL. SAY, THE SMITHS ARE COMIN' OVER TONIGHT
AN' A GOOD PROGRAM ON TOO. O BOY!!
R-R-R-G
GOSH— NO SOUND—NO JUICE AND HERE THEY COME !*@*!!
HELLO, JOE. WHAT'S UP- Y'LOOK BLUE
AW-W-HULLO
JUST TNIGHT MY BATT'RY GOE'S SOUR, AN' NOW I'LL HAVE T'LUG IT OUT TO GET IT RECHARGED!
BUT LISSEN JOE
WHY DO YOU DO IT?—USE YOUR ELECTRICITY AND CHARGE IT YOURSELF—HOME—WITH A TUNGAR
TUNGAR CHARGES OVER NIGHT

Is your battery always fully charged and fit?

Is it always toned up for best results whenever friends happen in—throughout every concert?

Keep it at full strength the simple, easy, inexpensive Tungar way.

Tungar—the go-between from house lighting circuit to battery—attaches wherever there is a lamp or a convenience outlet.

You don't have to move the battery. Just connect Tungar, turn on the current and leave it, any time day or night.

Tungar is *certain, clean, quiet.* There are no moving parts to get out of order or make noise. Its cost of operation is low.

Regular charging with Tungar keeps the battery in the pink of condition for every concert and prolongs its life.

Good for the auto battery too—the *same* Tungar.

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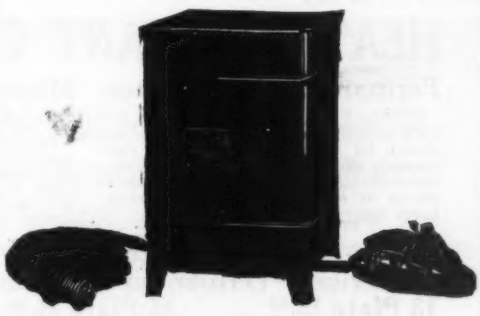

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Electrical Testing Laboratories of New York Say—

". . . the equivalent series resistance of each of the condensers is very small. That is, it is *so small* that it may be considered as *negligible*."

Radio News Laboratories Says—

". . . considered one of the best condensers we have tested. A dielectric loss resistance of 46 ohms at 1000 cycles . . ."

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Permanently Flat Plates

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Works: Schenectady, N. Y. 2030-F

were upturned, but without serious accident to the party or to the apparatus, although many loose articles such as glasses, pipes, etc., were lost.

The accident afforded a good test of the serviceability of the water-tight boxes, one of which, containing cameras, was strapped in the open cockpit of the overturned boat. After a half-hour's submersion the cameras and films were found to be bone-dry. In camp that night the repaired radio set gave the party messages from Los Angeles and Salt Lake City, and, for the first time, from Colorado Springs. The most interesting items of news were accounts of the results of the first two baseball games in the world's series.

October 19 the party reached Needles, 450 miles from Lees Ferry, bringing to an end one of the most remarkable surveying expeditions of all time.

The ease with which the party picked up broadcasting from distant points is all the more remarkable, not only because of the great depths of the canyon, but also on account of frequent "dry" thunderstorms in August and September.

Colonel Birdseye stated that although Los Angeles and San Francisco were never less than 400 or more miles away, it was seldom necessary to use the second stage of amplification to hear stations in those cities plainly. Yet, all this broadcasting was heard when the receiving set was from a thousand to five thousand feet below the rim of the canyon.

The party, which was selected with especial care, consisted of well-seasoned, experienced men, comprising, besides Colonel Birdseye, E. C. LaRue, hydraulic engineer, who for several years has been studying the problem of utilizing the waters of the Colorado River; R. C. Moore, State Geologist of Kansas, who for two years has been making geological investigations in Utah and Arizona; R. W. Burchard, topographic engineer; Emery C. Kolb of Grand Canyon, who in 1911, with his brother, made a boat trip from Green River, Wyo., through the Grand Canyon to the Gulf of California; L. R. Freeman of Pasadena, Calif., a well-known explorer, writer and boatman; Leigh Lint of Weiser, Idaho, and H. E. Blake, Jr. of Monticello, Utah, two husky youngsters with two years' experience in boating the rapids of the Colorado; Frank B. Dodge of Honolulu, a skillful boatman, expert swimmer and general utility man, capable of filling any position from instrument man to cook, and a cook.

THE SYMBOL OF SERVICE

CONTINENTAL

"New York's Leading Radio House"

Radiola VII

Distributors for the Radio Corporation of America

"The Radiola Pathfinder"

The Radiola VII is made up of two stages of transformer-coupled Radio frequency amplification, detector, and two stages of audio frequency amplification.

It is a two circuit Tuner designed for use with Radiotron UV-199 dry cell tubes, entirely self contained in a mahogany box with piano-hinged lid.

It is simple to operate yet very selective in tuning. Economy and efficiency are only two of the many advantages which the Radiola VII has over other sets of today.

Write for further information

2060-Q

CONTINENTAL RADIO & ELECTRIC CORPN.

6 and 15 Warren Street **New York, U. S. A.**

Federal Standard RADIO Products

The unexcelled performance of Federal Standard Radio Products

is the audible evidence of the fine material and engineering skill which go into every Federal part. And the Federal guarantee is insurance of satisfaction to every Federal purchaser.

Federal Head Sets are one of the more than 130 radio products which Federal manufactures and guarantees. Your receiving set is no better than its weakest part. Insist on Federal.

Federal Telephone & Telegraph Company

Factory: BUFFALO, N. Y.

BOSTON PHILADELPHIA SAN FRANCISCO
NEW YORK CHICAGO PITTSBURGH
LONDON, ENGLAND BRIDGEBURG, CANADA

The New
MU-RAD RECEIVER
MA-15

THE HORIZON of the radio art extended and broadened by this new perfection of radio reception—the more versatile, more simply operated receiver, *Mu-Rad MA-15*. Many important refinements—plug-in type radio frequency transformers, so that the MA-15 can be accommodated to any future changes of wave lengths or tubes, volt-meter for instantaneous readings of "A" or "B" batteries, new type vernier dials, operated by cams to eliminate back-lash, no other aerial than a 2-foot loop needed, and a wave length switch for bringing in short wave stations. Solid mahogany cabinet, with an engraved Formica panel. The MA-15 anticipates every possible use and requirement. *Guaranteed range, 1,000 miles using 2-foot loop.*

Another New MU-RAD Receiver MA-17

Three stages of radio and two of audio frequency amplification and detector. *One* tuning dial and two selecting dials, each independent of the other. Plug-in type r. f. transformers to care for changes of tube type or wave lengths. Panel-mounted volt-meter for quick reading of A and B batteries. Solid mahogany, Adam Brown hand-rubbed finish cabinet with loop fitted into top and compartment in base for "B" batteries. Guaranteed for 1000 miles reception using only a 2-foot loop.

WRITE FOR BOOKLET AND NAME OF NEAREST DEALER

MU-RAD LABORATORIES, INC.
808 FIFTH AVE ASBURY PARK, NEW JERSEY

Wild Rodeo Warriors at WJZ

(*Continued from page 27*)

it. Arms brandishing, bodies twisting and swaying, tom-tom beating a dull ferocious rhythm of concentrated passion, the three howled and wailed and howled again, until even the blase switchboard operator outside left her post to see what murder was under way.

The whole aspect of the affair was changed—no longer was the chief concern of Scott the enticing of the braves to the microphone; it was the much graver one of keeping them away from it, of removing them ere physical mutilation was performed upon the defenseless instrument.

"How — hy — a — roo. C'mon!" shouted the guide, swinging an imperial arm toward the door leading from the studio.

"Hy-e-e-e-e- How-o-o-o-o- Hy-a-a-a-a-a-a-a-a-" shrieked the frenzied braves unheedingly, threatening the "box-on-the-stick" with dire death.

"Hy! C'mon! APPLE-PIE!" yelled Scott.

Silence rent the howl-filled air. Three braves formed the battleground for a bitter struggle between pie-loving stomachs and vengeance-thirsty souls. The stomachs won. Eager anticipation upon their bronzed faces, childish delight sweeping aside all passion, they padded docilely across the studio to the door and their paternal guardian Scott.

And the wild and woolly West left a somewhat quavery-minded East to heave huge sighs of relief and resume its civilized methods undisturbed by aborigine attacks.

The Chicago Radio Show

(*Continued from page 26*)

The four center booths were occupied by Kennedy, Grebe, Crosley and Zenith. In the Kennedy booth were found the handsome new Kennedy furniture models which show so well the present day trend of radio development. All these sets of course were of the regenerative type. In the Grebe booth were found all the latest regenerative sets brought out by this well known old-timer.

Crosley had on exhibition the complete Crosley and Precision regenerative lines, together with a monster receiving set which required a truck for conveyance drawn by an elephant. This set had concealed within it a standard Crosley receiver with power amplifier and loud speaker, and when drawn through the streets of Chicago by the elephant attracted as much attention as the average circus parade.

RADIO FANS

Tune in on station
W E A F (New York)
every Thursday at 8.50 P. M. and listen to a story or article selected from
HEARST'S
INTERNATIONAL
This is one of the most popular weekly features "on the air"

FREE

Write for Free Copy of the Latest Radio Reprint D. It contains a complete story from Hearst's International Magazine. Address Radio Editor, Hearst's International Magazine, 119 West 40th Street, New York City.

Pall Mall Products

Hook Up and Description
of the famous ESSEX ONE TUBE COAST TO COAST CIRCUIT

FREE

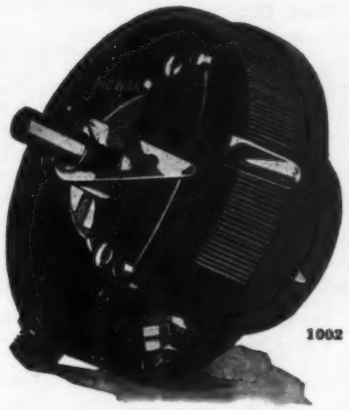
to the first 1,000 fans who send in a 2c. stamp and the names and addresses of five friends who are interested in Radio.

ESSEX MFG. CO., 119 Mulberry St. Newark, N. J.

—on Radio Parts means Quality and Perfection

Howard Radio Co. Inc. — Blue Seal — Guaranteed Products — Chicago, U.S.A.

Here's the HOWARD Master RHEOSTAT



This well-known HOWARD Micrometer, with instantaneous, SINGLE-KNOB CONTROL, is the smoothest running, the simplest and most easily adjustable rheostat made.

The single knob gives coarse or fine adjustment—instantly, accurately and easily. The micrometer sector is carried along with the main control and can be brought into use at whatever point desired.

Absolutely guaranteed. Highest grade materials used. Careful inspection and testing before shipment. Wire has practically a zero co-efficient, insuring perfect stability in operation. Carrying capacity 1½ amps.

6¾-ohm Micrometer Rheostat, $1.50—with dial, $1.75; 25 and 40-ohm Micrometer Rheostat, $1.50.

Ask your dealer to show samples of our product. Jobbers write for discounts direct.

HOWARD RADIO CO., Inc.
4248 No. Western Ave., Chicago, Ill.

1001—The standardized Rheostat, furnished in three resistances, to fit all tubes.

6½ Ohm Rheostat	Price	$1.10
25 Ohm Rheostat	Price	1.10
40 Ohm Rheostat	Price	1.10
60 Ohm Rheostat	Price	1.10

1003—The Howard Potentiometer, with its fine turns of constant-resistance wire, spaced to hair-breadth accuracy, is contributing an important share to the splendid results now being obtained with radio-frequency sets:

200 Ohm Potentiometer	Price	$1.50
400 Ohm Potentiometer	Price	2.00

1004—Accommodates up to six pairs of phones, and gives instantly any desired series or parallel connections:

Multi Terminal Receiver Plug....Price $2.00

1005—The Inductance Switches have the same handy knob as the famous Rheostat. The switch blade is of finest phosphor bronze, keyed to the knob, and when adjusted to the desired pressure on the points it will not vary or come loose:

Large Knob Inductance Switch....Price 50c
Small Knob Inductance Switch....Price 50c
(1" Radius)

Use HOMMEL SERVICE to build your radio business

DISTRIBUTORS FOR
Radio Corporation of America
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leading manufacturers

Complete stocks of strictly high grade nationally advertised radio apparatus are constantly carried by this company to enable you to build your radio business on the right foundation. Your success is dependent largely on the products you sell, and your ability to serve your customers promptly.

Aligning yourself with the Hommel organization makes it possible for you to always have access to ample stocks of the leading lines of radio equipment without the necessity of tying up your working capital.

Let us show you how you can advantageously use Hommel Service. Write for the Hommel Encyclopedia 236-E.

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530-534 FERNANDO ST. — PITTSBURGH, PENN'A

Dr. Wm.D. Reynolds,
Denver, Colo.

Hyattville, Wyo.
May 30. 23.

Dear Dr:

As to results obtained with the little Electric Specialty Dynamotor, I am pleased to say I have been getting wonderful results with it, but instead of running off 6 Volt battery, have been using an 8 Volt, which gives me a high voltage of 600 Volts and, what everybody says, a Beautiful Tone, every card I get mentions that a fine note I have; I have talked Fone (using loop modulation) with 5SK at Fort Worth Texas, after daylight in the morning, Falconi at 5ZA Roswell New Mex. says my fone so QSA he can hear it 10 feet from Fones, and work him with CW way after sun rise, which is going some; I work most all the Boys in Denver and they're all crazy about my tone. I am more than pleased with the Dynamotor, and any time I can be of service to you regarding its action just let me know.

Yours truly,

D.G. VanDyke

TRADE "ESCO" MARK
Quality always Supreme
ELECTRIC SPECIALTY COMPANY
STAMFORD, CONN., U. S. A.

Practical Wireless Telegraphy
By Elmer E. Bucher
More than 90,000 copies of this book have been sold—your copy is ready to be shipped. **Price $2.25**
WIRELESS PRESS, 326 Broadway, New York

COPPERWELD ANTENNA WIRE IN CARTONS
"The Ideal Radio Antenna"
Strongest—Most Efficient—Best

COPPERWELD LEAD-IN AND GROUND WIRE IN CARTONS
Strong—Efficient—Durable—Inconspicuous
Has the Underwriters' OK

100, 150 & 200 ft. per carton

25, 50 & 100 ft. per carton

The construction directions and Underwriters' regulations on the carton answer all questions

SAVE TIME — BUY IT IN CARTONS

"COPPERWELD"

MADE EXCLUSIVELY BY THE COPPER CLAD STEEL COMPANY

New York, N. Y.	Rankin, Pa. (Pgh. Sub.)	Chicago, Illinois	San Francisco, Calif.
30 Church Street	Braddock Post Office	129 S. Jefferson Street	403 Rialto Building

Zenith displayed a new line of regenerative receivers with the new three-stage amplifier in various cabinet designs, the most outstanding feature being the combination of the Zenith receiver with the Brunswick phonograph. In the center of the booth under a spotlight was displayed a 300-pound cake of ice having frozen within it a copy of the last message received from the MacMillan North Pole Expedition, several days before the show, telling how glad MacMillan was to have Zenith radio with him which was giving him entertainment, news and messages from home. The ice surrounding this message attracted much comment, and certainly created a cooler atmosphere.

The United Manufacturing & Distributing Company nearly broke up the show on one particular evening by shooting out from the balcony 10,000 small toy aeroplanes. The crowd went wild in their efforts to obtain these toys and the disturbance became so great that the show management finally had to put a stop to it.

In the Fansteel booth was found the new Balkite Rectifier for battery charging. This new development attracted much interest.

H. H. Frost of Chicago, in addition to displaying the largest pair of headphones ever built, had among the personnel in his booth a highly decorated individual carrying a sign, "The Man Who Never Smiles—Make Me Smile and Get a Pair of Frost-Fones Free." From all reports the correct way to make the gentleman smile was to wiggle your ears.

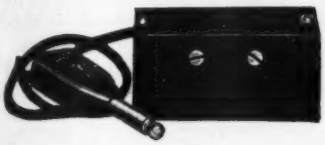
In the booth of the Electrical Research Laboratory, making the well known Erla reflex apparatus, was found a highly educational and an extremely attractive exhibit showing the action of the Erla reflex circuit. The tubes, coils, condensers, etc., were illustrated in electrically lighted glass form; the wires connecting them being Giessler tubes of special construction. By an automatic switching arrangement the current was thrown off and on these various circuits so that the onlookers could follow the course of a signal through the circuit out to the loud speaker.

The National Carbon Company displayed a giant panel with meters that could be seen 100 feet away. This display showed the operation of various types of tubes with various values of grid and plate batteries. The operator of the apparatus talked through a Western Electric announcing system with a horn which was suspended above and directed immediately on the crowd in front of the booth, making this an extremely successful and educational exhibit.

The French Battery and Carbon

PACENT PLUG and JACK DEVICES

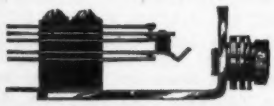
For Every Radio Requirement



Pacent Jackset—A de luxe accessory for making multiple connections. Cat. No. 5240. **Price, $1.75.**

Pacent Multi-adapter—Provides one to five plug connections. Cat. No. 54. **Price, $1.50.**

Pacent Duoplug—A quality plug for most particular radio users. Accommodates two pairs of phones. Special toggle feature insures positive contact. All types terminals. No tools required. Cat. No. 100. **Price, $1.00.**



PACENT JACKS

There is a Pacent quality jack for every circuit. Ten styles. Nos. 61-70. **Prices 60c. to $1.00.**

The New Catalog

Additional Pacent plug and jack devices and other radio essentials are described in the new Pacent Catalog No. W-12, sent free on request.

Pacent Electric Co., Inc.
22 Park Place New York

Sales Offices: Chicago, Philadelphia, St. Louis, San Francisco, Minneapolis, Washington, Jacksonville.

Pacent
RADIO ESSENTIALS

PREPARED RADIO MEASUREMENTS
with
SELF COMPUTING CHARTS
By Ralph R. Batcher

A book that is devoted entirely to simplifying the methods of determing electrical and geometrical constants for radio instruments and appliances.

The accuracy of these charts is above the accuracy with which the various factors that enter in the formulas can be measured with ordinary means.

Price $2.00

WIRELESS PRESS, INC. **326 Broadway, New York**

The FANSTEEL

Balkite

PATENTS APPLIED FOR

battery charger

has no vibrators, bulbs or moving parts and is entirely noiseless

FANSTEEL BALKITE

is a new metal developed for this charger. It acts as a valve, allowing current to flow into the battery but not out of it. It is the most efficient charger valve made, is practically indestructible, and does away with noisy, delicate vibrators and fragile bulbs.

The Gould Storage Battery Company is also marketing, under the Fansteel Balkite Patents, a complete battery and recharging unit known as the Gould Unipower, into which this charger, under the name, "The Fansteel Balkite Rectifier," has been incorporated.

The Fansteel Balkite Battery Charger for Radio "A" Batteries [6 volt] is an entirely new type of rectifier, based on the use of Fansteel Balkite, a new and rare metal developed for this purpose. It is entirely noiseless. It cannot deteriorate through use or disuse. It has nothing to replace, adjust, or get out of order. It cannot discharge or short circuit the battery, and requires no attention other than an occasional filling with distilled water. It will not overcharge, and cannot fail to operate when connected to the battery and line current. It is unaffected by temperature or fluctuations in line current. It is simple, efficient, and indestructible except through abuse.

The Fansteel Balkite Battery Charger will charge the ordinary 6 volt radio "A" or automobile storage battery at 3 amperes, from 110-120 AC, 60 cycle current. It comes complete and ready for use. Get it from your dealer, or use the coupon below.

Price, $18

($18.50 West of the Rockies)

FANSTEEL PRODUCTS CO., Inc.
Dept. 7-B North Chicago, Illinois

Dealers and Jobbers: The Fansteel Balkite Battery Charger does away with complaints and replacement troubles. Write for literature and discounts.

Dept. 7-B
FANSTEEL PRODUCTS CO., Inc., No. Chicago, Ill.

Enclosed please find $18. ($18.50 west of the Rockies.) Send me the Fansteel Balkite Battery Charger for Radio 6 volt "A" Batteries. If I am not entirely satisfied I will return it and you will refund my money.

Name .....
Street .....
City ..... *State* .....

ELECTRAD PRODUCTS

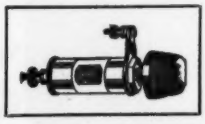
The NEW DIODE

Discard crystals! Use the Electrad Diode in all circuits. Overcomes former difficulties with reflex work. Gives greater volume, greater selectivity and steadies the circuit. Eliminates tedious adjustments for change of wave lengths. A perfect detector tube. Real results. Absolutely guaranteed.

RADIO'S GREATEST INVENTION

$2

Socket 50c



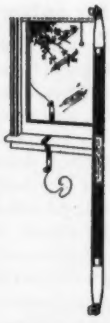
The NEW VARIOHM

Double your receiving distance. Give the precision value of grid leak resistance your detector tube requires. Variohm does the work of a thousand ordinary grid leaks. Resistance variations secured are infinitely close and gradual, not by steps and jumps. Range ¼ to 10 megohms. Increases volume. Eliminates circuit noises. Enables you to get distant stations clear and distinct. Absolutely guaranteed.

75¢

The LEAD-IN

Fits right under closed window. Can be bent into any shape to fit ledges. Covered with fire-proof insulating material which prevents grounding of circuits on wet window sills. Takes the place of ungainly porcelain tubes and holes in the window sash. Always presents a neat appearance. Fitted with Fahnestock clips.



40¢

All products at your dealer's, otherwise send purchase price and you will be supplied postpaid.

Write for FREE Cockaday-Diode Reflex Circuit.

ELECTRAD, Inc.

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NEW YORK

The Supreme Insulation

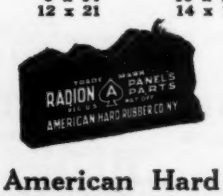
RADION Panels

are easiest to drill, saw, or engrave with simple tools at home

18 Stock Sizes Radion Panels

Mahoganite and Black

6 x 10½	6 x 14	6 x 21
7 x 9	7 x 10	7 x 12
7 x 14	7 x 18	7 x 21
7 x 24	7 x 26	7 x 48
9 x 14	10 x 12	12 x 14
12 x 21	14 x 18	20 x 24



Look for this stamp on every genuine RADION Panel. Beware of substitutes and imitations.

American Hard Rubber Co.

11 Mercer Street **New York**

Company showed the fans, through a graphic push button board the "cents per hour" battery cost of the various types of tubes.

Several neutrodynes were shown, including the Fada and the Garod. The Western Coil and Electric Company exhibited their new Radiodyne set.

The desire of the radio fan for real information in all phases of radio was strikingly shown by the way they flocked to the booth of the various publishers. Needless to say THE WIRELESS AGE got its share of the subscriptions returned at the show.

It is of course impossible to give all the exhibitors the praise that is due them, and all that can be done in writing up a show of this kind is to cover the high lights which stand out from the kaleidoscope of impressions.

It was a great show, and there is no question but that every exhibitor was well repaid for his expenditures both of money and of time. If progress along the lines of radio show attendance is as great next year as it has been during the past year, it will be impossible to find a hall big enough to hold the next Chicago Radio Show.

STATIONS WORKED AND HEARD

Stations worked should be enclosed in brackets. Lists will be published in issue immediately following receipt of list. Spark and C. W. stations should be arranged in separate groups.

2CTN—J. M. Cummings, Richmond Hill, N. Y.

4sb, 4ku, 4eb, 4db, 4yi, 4mb, 4na, 4qf, 5vr, 5ahh, 5aiu, 5amh, 5abt, 5gm, 5kg, 5gj, 5aqt, 5be, 5lr, 5tj, 5kw, 5in, 6bqe, 6ka, 6bbc, 6pl, 6cgp, 6cfz, 6awt, 7zu, 7abb, 7ln, 9apf, 9ahz, 9blg, 9bfi, 9dhg, 9ekf, 9cjc, 9dsw, 9bqy, 9avg, 9ceh, 9dmj, 9bwv, 9cga, 9ck, 9dgw, 9ctr, 9dfp, 9dkx, 9dpc, 9eht, 9dej, 9cgy, 9ccs, 9eky, 9cog, 9com, 9bik, 9bis, 9aal.

6BSR—WM. KRAUSE, Los Angeles, Cal.

Can. 3bp, 4ft, 4cs, Can. 5cn, 5zav, 5avo, 5de, 5adb, 5ah, 5go, 5lr, 5sn, 5in, 5nn, 5ph, 5lr, 5la, 5dv, 5adb, 5fa, 5gn, 5ana, 5akn, 5yr, 5nn, 5me, 5gj, 5gn, 5in, 7ks, 7aiy, 7ed, 7as, 7iw, 7asn, 7oe, 7lw, 7qw, 7ya, 7zz, 7wn, 7aci, 7dc, 7io, 7ae, 7nt, 7aci, 7zz, 7lw, 7js, 7xt, 7ahi, 7to, 8aah, 8bfm, 8bda, 9bez, 9apf, 9mk, 9pw, 9dqu, 9bji, 9ajg, 9dkb, 9bun, 9cfy, 9os, 9bsp, 9dew, 9eky, 9bly, 9cte, 9cvc, 9dry, 9bzi, 9ctg, 9aon, 9bal, 9aps, 9aou, 9apa, 9et, 9zav.

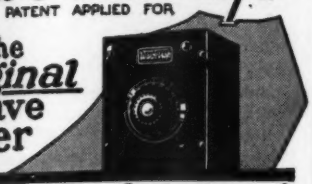
9ZT—D. C. WALLACE, Minneapolis, Minn. Heard during November. All districts worked.

(1er), (1hx), 1ll, 1sn, 1xm, 1vv, (1yb), 1yd, 1yk, 1ada, 1aja, 1aqi, 1bcg, 1bgk, 1boq, (1ckp), (1cmp), 1crw, 1csu, (1xaq), 2ah, 2bx, (2gk), 2ig, 2kf, 2ku, 2pa, (2rb), 2rk, 2sh, 2ts, 2wb, (2xq), 2afp, 2agb, 2ana, 2awk, 2bkq, 2bmr, 2brh, 2brb, 2brc, (2bte), 2bxp, 2bxw, 2cfb, 2cjr, 2cka, (2cqz), 2csl, (2cxd), (2cxf), (2xaq), 3ab, 3bw, 3hg, 3hs, 3jj, 3nr,

FERBEND

TRADE Wave Trap MARK

PATENT APPLIED FOR



The *Original* Wave Filter

Stops Interference!

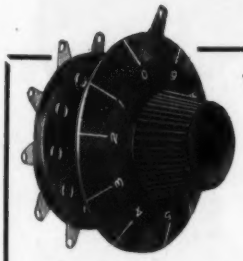
Eliminates interfering stations.
Improves the selectivity of the set.
Eliminates local broadcasting.
Selects between conflicting stations.
Simplifies tuning.
Often increases signal strength.
Reduces howling and squealing.

The WAVE TRAP is mounted on a Formica panel in a beautiful mahogany finished cabinet 6x5x6, and is a high grade instrument throughout enhancing the appearance of the most expensive sets.

8.50 CHARGES PREPAID

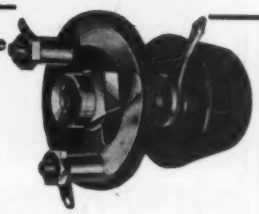
Ferbend Electric Co.
18 E. SOUTH WATER ST.
CHICAGO

WALNART TWINS



Variable Grid Resistance
$1.00

Inductance Switch
$1.25



To get distance you must have positive contacts. The average arrangement of switch points is not satisfactory. Walnart inductance switch gives positive contacts—insuring better reception.

Different tubes require different grid resistance—Walnart Variable grid resistance varying from minimum to maximum of six Megohms clears up signals and adds to the efficiency of the set.

The instruments are made of highest quality material; base is genuine Condensite-Celoron made under Bakelite patents.

WALNART ELECTRIC MFG. CO. Dept. 504, 1249 W. Van Buren St. Chicago, Illinois

A REAL OPPORTUNITY as SALES ENGINEER

with large corporation selling essential radio accessory.

Qualifications:

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Technical College Training.
Experience in Radio.
Willingness to Travel.
Preferably Member A. R. R. L.

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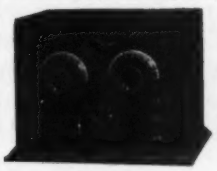

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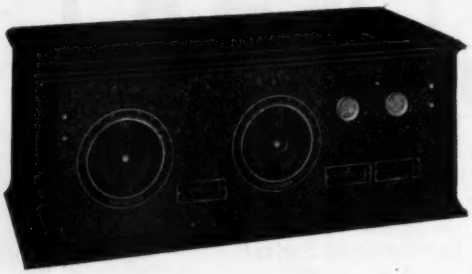

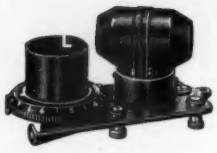

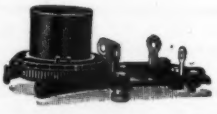

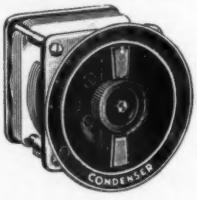

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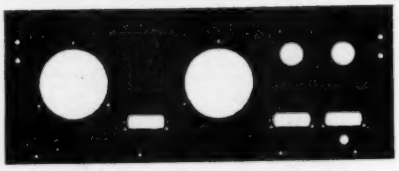

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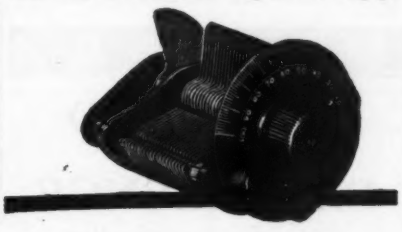

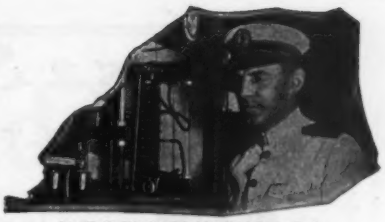

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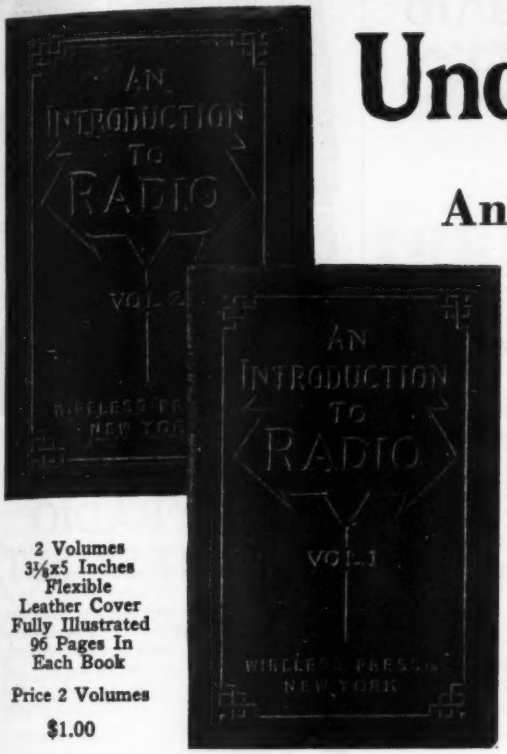

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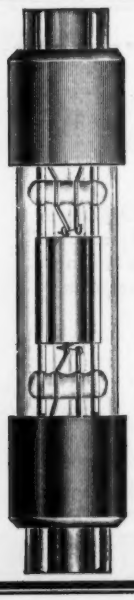

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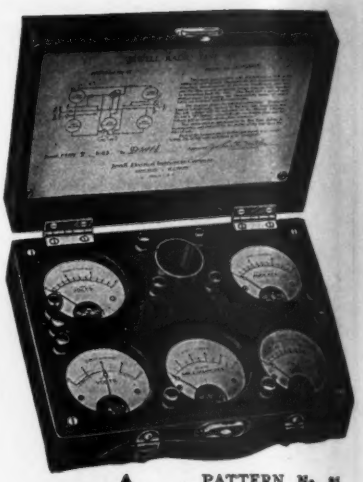

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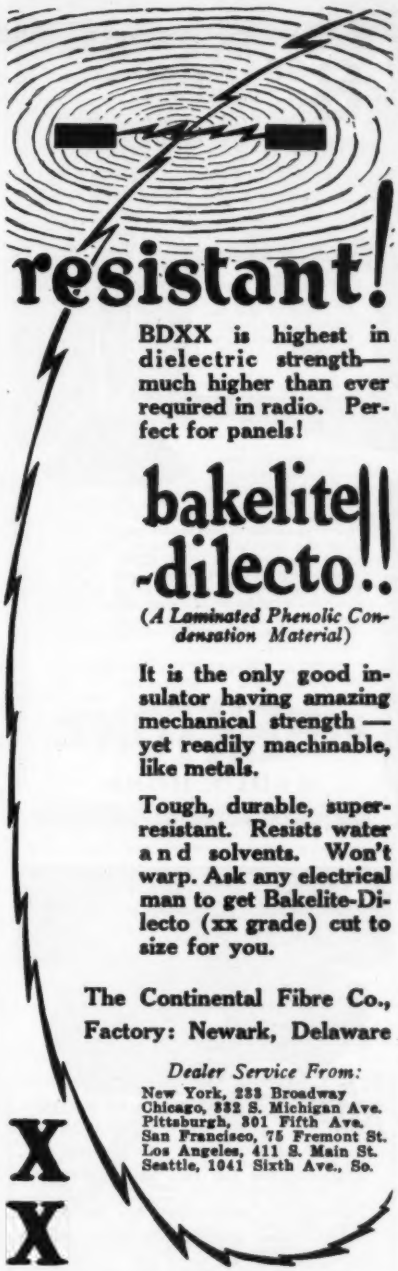
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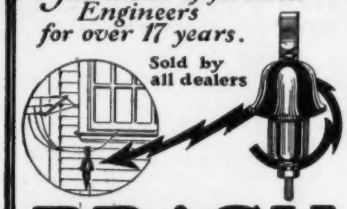

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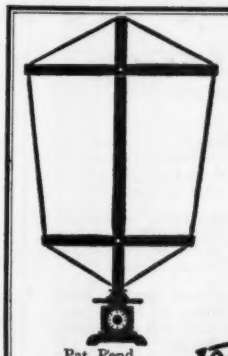

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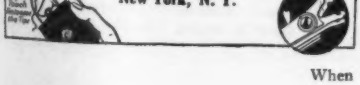

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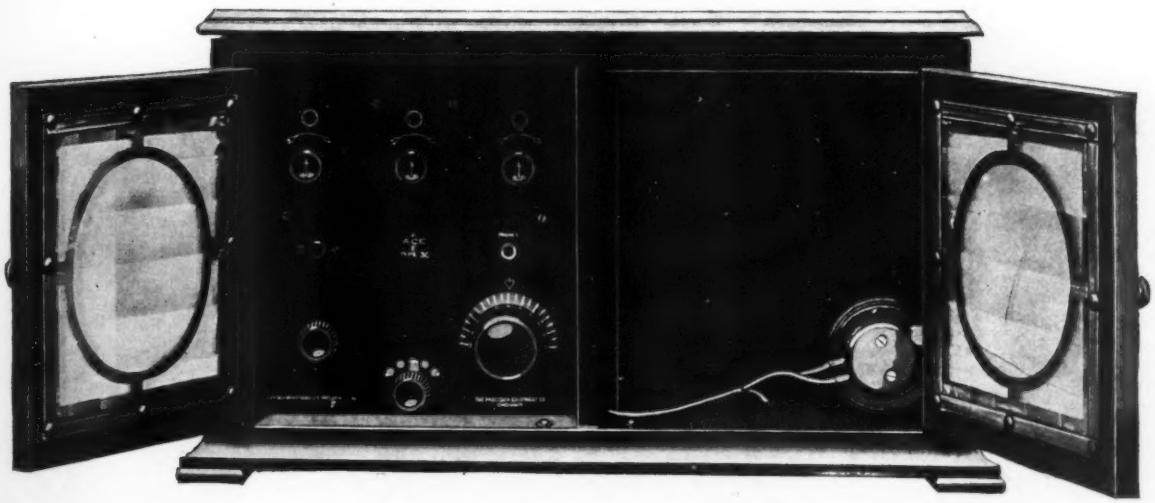

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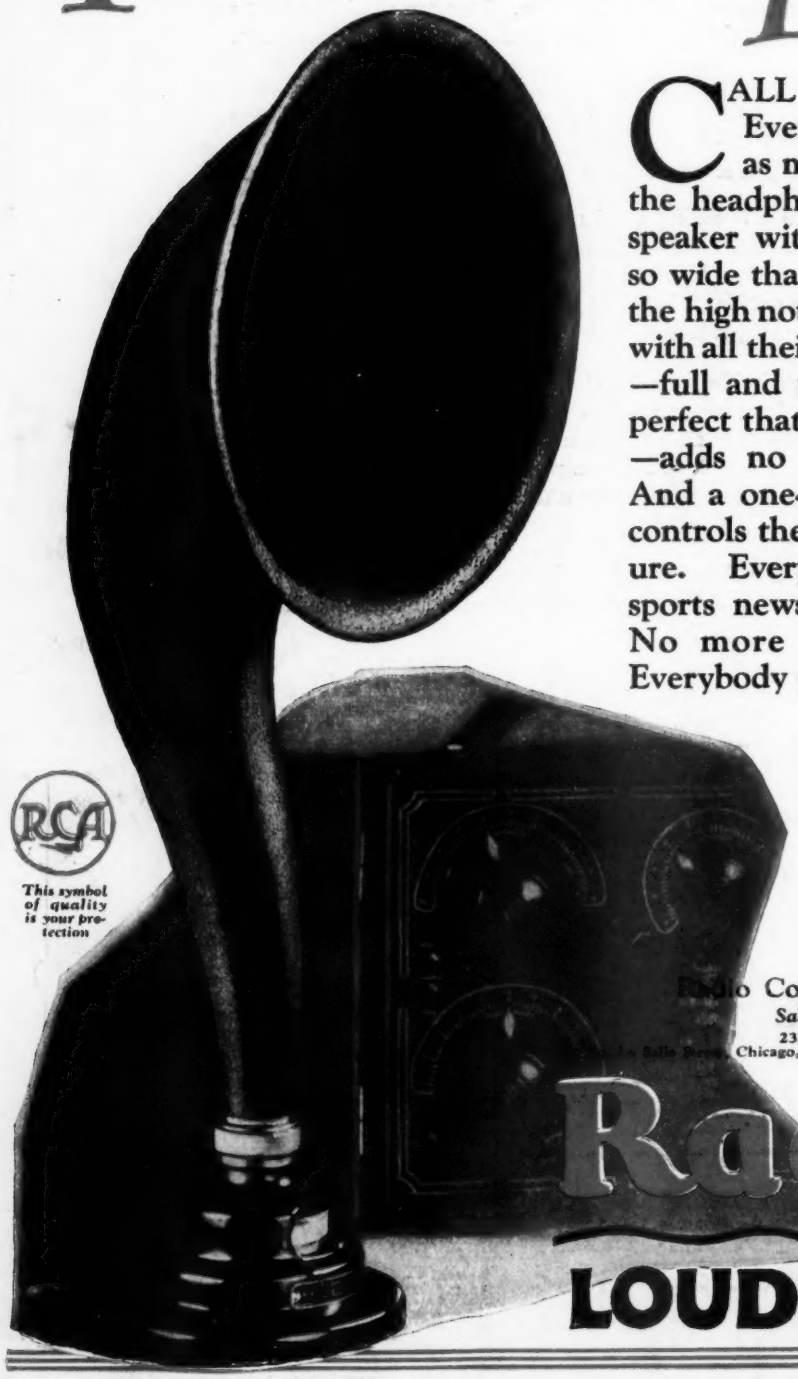

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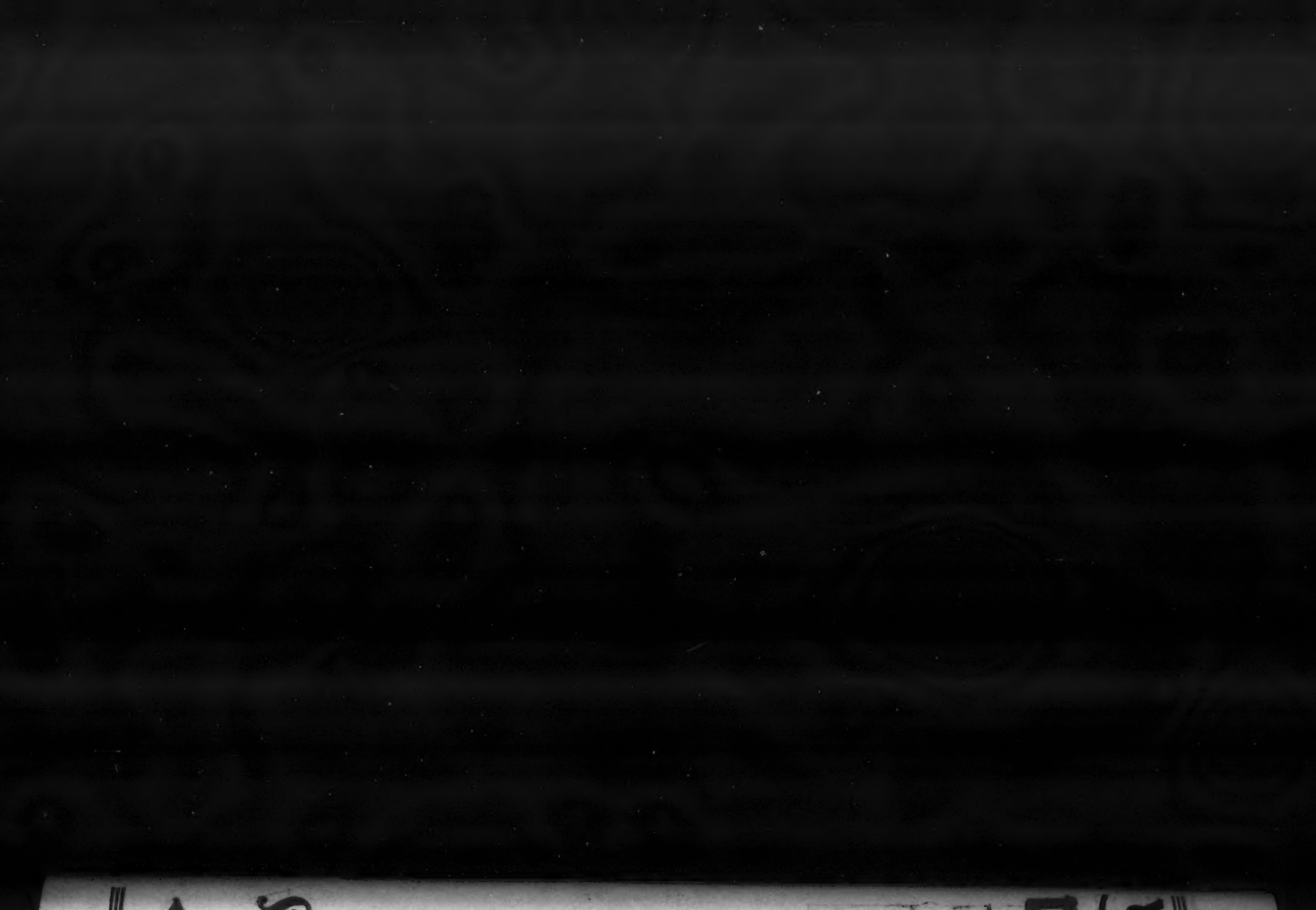
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